REMEDIAL INVESTIGATION REPORT
HATCO SITE
FORDS, NEW JERSEY

May 2016

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ACRONYMNS

ACO	Administrative Consent Order
AEC	Area of Environmental Concern
AOC	Area of Concern
DRAI	Dan Raviv Associates, Inc.
GWQC	Ground Water Quality Standards (1993)
GWSL	Ground Water Screening Level (2013)
IGW SCC	Impact to Groundwater Soil Cleanup Criteria (1999)
IRM	Interim Remedial Measure
LEL	Lowest Effects Level
LNAPL	Light Non-Aqueous Phase Liquids
LSRP	Licensed Site Remediation Professional
NAPL	Non-Aqueous Phase Liquids, a general term for separate phase products without regard to specific gravity
NJDEP	New Jersey Department of Environmental Protection
NR IASL	Non-Residential Indoor Air Screening Levels (2013)
NRDC SCC	Non-Residential Direct Soil Cleanup Criteria (2006)
RDC SCC	Soil Cleanup Criteria (2006)
RIR	Remedial Investigation Report
NR SGSL	Non-Residential Soil Gas Screening Levels (2013)
SEL	Severe Effects Level
USEPA	United States Environmental Protection Agency, Region II
VI	Vapor Intrusion

CHEMICAL COMPOUND ABBREVIATIONS

BBP	Butyl benzyl Phthalate
BEHP	Bis-(2-ethylhexyl) Phthalate; also known as Diethylhexyl Phthalate
DEP	Diethyl Phthalate
DNBP	Di-n-butyl Phthalate
DNOP	Di-n-octyl Phthalate
PCBs	Polychlorinated Biphenyls

SECTION 1.0
INTRODUCTION

1.1 SITE DESCRIPTION AND BACKGROUND

The Hatco Corporation (Hatco) site is an industrial facility with a mailing address of 1020 King Georges Post Road in Fords, New Jersey **(Figure 1.1-1**, a USGS Quadrangle Map). The term "Hatco" as used in this report refers to historical operations prior to November 4, 2002. The facility is currently owned and operated by Chemtura Corporation (Chemtura). This Remedial Investigation Report (RIR) does not address current operations by Chemtura.

The facility is located in Fords, Woodbridge Township, Middlesex County, New Jersey and encompasses the following parcels (**Figure 1.1-2**):

- Block 60, Lot 1.021 (area east of Sling Tail Creek and southern portion of the main plant)
- Block 67, Lot 100.01 (main plant area)

Offsite properties are also being addressed as part of the Hatco remediation. The offsite parcels include:

- EPEC Polymers, located south of Hatco at Block 93, Lot 100.01
- Woodbridge Pond, located west of Hatco at Block 71, Lot 7
- CP Properties, Inc., located west of Hatco at Block 71, Lot 6
- Vacant wetlands, located south of Hatco at Block 77, Lot 100.01

For the purposes of this Remedial Investigation Report (RIR) the term "site" applies to the former Hatco facility only and the four parcels listed above are described as "offsite."

The Hatco site is tracked by New Jersey Department of Environmental Protection (NJDEP) Site Remediation Program (SRP) as Preferred ID No. G000003943. The case is currently overseen by Licensed Site Remediation Professional (LSRP) Mark D. Fisher (License No. 586626).

Hatco is located in a heavily industrialized area north of Raritan Bay and surrounded by major transportation including highways and rail. The plant is north of Riverside Drive, between a clover leaf intersection with Route 287 and Crows Mill Creek (a tributary to the Raritan River) and south of King Georges Post Road.

The following NJDEP Incident Numbers are associated with this site:

- 83-11-30-04C (release of about 100 gallons of DOP on November 29, 1983)
- 79-3-9-3 (release of about 18,700 pounds of alcohols on March 9, 1979)
- 88-09-02-1521 (release on September 2, 1988)
- 90-06-15-1641 (release of about 1300 gallons of DIDP-E on June 15, 1990)
- 92-2-15-0859-40 (release of about 300 gallons of DIDP on February 15, 1992)

1.2 REPORT PURPOSE AND ORGANIZATION

This RIR is intended to satisfy the statutory requirement for sites with an obligation to remediate prior to May 7, 1999 to submit a complete RIR by May 7, 2016 (with an approved 2-year extension to the original May 7, 2014 deadline). Weston Solutions, Inc. (Weston) assumed responsibility for contamination associated with historical releases at the Hatco site prior to November 4, 2002. The remedial investigation of the Hatco site was largely completed prior to Weston's involvement with this project. Weston assumed responsibility through an environmental liability transfer. Weston's obligations and requirements are described in the following key documents, copies of which are provided in **Appendices 1 through 6**:

- Risk-Based Remedy Approval, Dated March 30, 2005, issued by letter from United States Environmental Protection Agency (USEPA) to Weston **(Appendix 1)**
- Remediation Agreement, dated April 8, 2005, by and between Hatco Corporation (Hatco), W.R. Grace &Co., Conn., Remedium Group, Inc., and Weston **(Appendix 2**)
- Natural Resources Settlement Agreement dated April 8, 2005, between the New Jersey Department of Environmental Protection (NJDEP), Hatco, W.R. Grace, Remedium, and Weston and the associated Natural Resource Damages release executed by NJDEP on May 11 and 12, 2005 **(Appendix 3)**
- Settlement Agreement between Hatco, Debtors, NJDEP, Weston and ACE **(Appendix 4)**
- Draft Remedial Action Workplan (RAWP), dated March 29, 2001 and prepared by URS Corporation (URS) on behalf of Grace and Hatco **(Appendix 5)**
- Administrative Consent Order (ACO), recorded August 16, 2005, issued by NJDEP to Weston and ACE **(Appendix 6)**

Consistent with the governing documents, this RIR addresses conditions related to releases that occurred prior to November 4, 2002. This RIR does not address activities related to facility operations after that time. This report addresses Areas of Concern (AOC) identified at the time the key documents were executed as wells as related conditions identified during the course of investigation and remediation activities for which Weston is responsible.

The RIR relies upon extensive prior investigative and remediation work, referencing previous submittals and key documents associated with prior work. Where applicable, electronic copies of available referenced documents are provided as appendices to this report. Weston relies upon the accuracy and representativeness of the file documents prepared by other parties and submitted previously for agency review. Weston conducted technical reviews of the historical reports and discrepancies or errors identified are noted in this report.

Section 2 provides historical information about Hatco's operations from prior to facility construction through November 4, 2002 where those operations provide background for understanding the AOCs. Section 2 also describes the AOCs and identifies prior investigation and remediation work previously documented in each AOC. The discussions provided in this report are general; details regarding previous observations, data interpretations and historical site conditions are presented in the supporting documents provided as appendices to this RIR. This report is not intended to reevaluate data and findings previously reported to and reviewed by the applicable regulatory agencies. At the end of each AOC's discussion there is a statement

regarding whether further work was required to complete the delineation of that AOC. If so, Section 7 presents investigations and data that have not already been submitted to NJDEP but are required to complete the AOC-specific RIR. HAZSITE electronic deliverables were emailed to NJDEP for the data introduced in Section 7.

Section 3 contains site-wide physical setting information.

Section 4 provides LSRP program-specific information such as regulatory timeframes, standards applied and variances/deviations associated with data collected by Weston.

Section 5 discusses remedial actions that generated data upon which this Remedial Investigation (RI) relies and LNAPL IRMs and delineation;

Section 6 discusses quality assurance/quality control evaluation for data being submitted with this report;

Section 7 provides recent data obtained for AOCs discussed in Section 2 where the conclusion was that further investigation was required to complete the RI. The beginning of the section provides an overview of sampling methodology, and QA/QC information.

Section 8 provides a broad summary of the site status and includes a proposal for a Classification Exception Area (CEA) to address the groundwater (AOC 15).

Section 9 updates the receptor evaluation

The first Table in the Tables section explains the data qualifiers and nomenclature used in the tables.

SECTION 2.0
SITE HISTORY

2.1 OWNERSHIP AND OPERATIONAL HISTORY

The earliest available history for the site was obtained from the District Court Decision Findings of Fact dated April 29, 1994 (**Appendix 7**). In the early 1950s, a brick and tile manufacturer used the Fords property as a clay pit. In approximately 1954, Mr. William Hackman, the owner of the Hatco Chemical Company, purchased the Fords property and relocated his chemical manufacturing business there. The Hatco Chemical Company previously was located in Kearny, New Jersey, where it manufactured plasticizers, synthetic lubricants and napalm. Upon arrival at the Fords property in 1954, the Hatco Chemical Company had one reactor, one stripper, one refiner, a filter press and tanks. From approximately 1954 until 1959, Hackman owned and operated the Hatco Chemical Company on the Fords property. From approximately 1954 until 1959, two plants were in operation at the Hatco Chemical Company:

- An esterification plant (Ester I) where plasticizers and synthetic lubricants, including dioctyl phthalate (DOP), dibutyl phthalate (DBP) and diisooctyl phthalate, were manufactured from acids and alcohols; and,
- A sebacic acid plant where raw materials were generated to make aviation turbine oils. During this period [1954 to 1959], alcohols, sebacic acid and phthalic anhydride were stored at the site and the railroad siding was used to load and unload tankers.

Other raw materials brought to the site at that time included octyl alcohol, butyl alcohol, 2-ethylhexyl alcohol and castor oil. Between 1954 and 1959, Hackman dug at least one settling pond that was designed to handle waste by allowing product to separate from water. During this period, liquid wastes flowed into the pond system. After settling, the effluent was released from the pond and flowed through marsh land into the Raritan River.

In 1958 manufacturing of specialty organic esters began at the site. This consisted of the manufacture of 2-ethylhexanol ester and sebacic acid ester used in manufacturing synthetic lubricants for jet and military aircraft engines.

In June 1959 Grace purchased the Hatco Chemical Company from Hackman. The business became a division of Grace known as the Hatco Chemical Division. From 1959 until August 21, 1978, Grace owned and operated the Fords facility. During this period, Grace manufactured phthalic anhydride, plasticizers, benzyl chloride, sebacic acid, capryl alcohol, and synthetic lubricants. These products, as well as raw materials and manufacturing by-products, were stored and handled at the Site. The following operations were reported during Grace's ownership period:

- In or around 1960, the Hatco Chemical Division installed two thermal units ("SH-1 and SH-2") to provide heat for a new reactor added in the Ester I plant (see AOC 4). From approximately 1960 to 1966 Aroclor 1248 and Aroclor 1254 were purchased and used in hot oil heating systems in the facility's Ester I unit, sebacic acid plant, phthalic anhydride plant, capryl still and molecular still.

- By 1961, Grace had expanded the pond system, adding additional ponds, one of which subsequently was divided into two ponds, for a total of four ponds at the site (see AOC 2). With the settling pond system, Grace sought to minimize the amount of process waste discharged and to recover suspended solids containing product. To accomplish these goals, Grace skimmed the esters and other organic matter that floated to the surface of the ponds and neutralized the remaining liquid effluent with lime slurry. The recovered product was returned to the plant to manufacture off-color plasticizer ("OCP") to sell as a Grace product. While in operation, semi-solid matter accumulated in the ponds, thereby necessitating periodic cleaning. Known as "demucking," this process involved scooping solid material from the bottom of the ponds. The dredged material was deposited in an area west of ponds three and four known as the "muck storage area." The four unlined holding ponds, designated Ponds 1 through 4, received wastewater from the manufacturing operations. Periodically, semi-solid materials were removed from the bottom of the ponds and placed on the surface soil near the western boundary of the site designated the "Muck Area". Liquid from the ponds was conveyed to a series of trenches that directed the residuals to a tributary of Crows Mill Creek along the west boundary of the site (see Channel A in AOC 21A).
- The Hatco Chemical Division constructed and began operating a benzyl chloride plant. The plant manufactured benzyl chloride which in turn was combined with phthalic anhydride to produce butyl benzyl phthalate ("BBP"), a plasticizer. The benzyl chloride plant operated until 1965.
- In 1961 and 1963, the Hatco Chemical Division built two plants on the eastern portion of the Fords property, known as PA-1 and PA-2. These plants manufactured phthalic anhydride from naphthalene (see AOC 6).
- The Hatco Chemical Division began the manufacturing operations of PA-1 in 1961 and PA-2 in 1963. While the PA plants were in operation, still bottoms from the phthalic anhydride production were deposited in an area to the east of the PA plants referred to as the "PA Disposal Area." (See AOC 7A.) Naphthalene and air were the raw materials used to manufacture phthalic anhydride. The manufacturing process differed between the two plants. At PA-1, naphthalene was fed directly into a stream of hot air inside a system known as a fluidized bed reactor. PA-2 utilized a fixed-bed reactor, which required the naphthalene first to be reduced to vapor in a naphthalene evaporator prior to being introduced into the reactor. Naphthalene has a distinctive odor similar to the smell of moth balls. Raw naphthalene is amber in color. Pure phthalic anhydride is white. The phthalic anhydride manufacturing processes at PA-1 and PA-2 generated a molten distilled residue, which was poured into pie-shaped containers and cooled. In this form, the byproduct is known as a solid still bottom ("PA still bottom" or as designated under RCRA "K024"). The PA still bottoms were black in color and brittle in substance. The process at PA-1 required naphthalene of a higher purity. The PA-2 system used naphthalene of a much cruder quality, which produced a still bottom with more impurities and greater contaminants. Naphthalene is not a component of the PA still bottoms; it dissipates in the phthalic anhydride cooking process. The naphthalene evaporator at PA-2 also generated still bottoms ("naphthalene still bottoms"), which were viscous or tarry in substance, dark brown in color and constituently different from PA still bottoms. Production of phthalic anhydride at the two PA plants ceased in 1971. The Hatco Chemical Division continued to use phthalic anhydride in its operations, purchasing quantities from outside suppliers to manufacture various esters. The PA plants were demolished in the mid-1980s.

- In approximately 1964, Grace discontinued use of the sebacic acid and benzyl chloride plants and the capryl and molecular stills. The use of PCBs was discontinued between 1966 and 1970.
- In 1966 Grace completed the construction of sewer lines (AOC 22) at the site to connect the Fords facility to the Middlesex County Sewerage Authority ("MCSA"). The MCSA later changed its name to the Middlesex County Utilities Authority ("MCUA"). As part of the MCSA connection, Grace installed two clay-lined lagoons at the Fords facility. The lagoons were designed and used, until 1971, as a temporary storage location for plant effluent prior to discharge to the MCSA. When Grace's gravity-based settling pond system and the clay-lined lagoons were in operation between 1966 and 1971, process effluent flowed from the settling ponds to the clay-lined lagoons to sewers connected to MCSA. Liquid waste from the [PA] plants was released to the lagoons and ultimately to the MCUA.
- In 1969 the State directed the Hatco Chemical Division of W.R. Grace to eliminate the ponds because of odor problems. According to a letter dated April 5, 1971, from Grace Hatco Chemical Division to NJDEP regarding Air Pollution Abatement March 1971, "During the month of March all ponds [AOC 2] were taken out of service and backfilled. The two lagoons [AOC 1] were drained of all liquids and will be used only in case of an emergency situation…"
- On August 21, 1978, Hatco Chemical, which was a division of W.R. Grace, was purchased by Alex Kaufman. Hatco was a major producer of synthetic lubricants supplying half of the worlds' supply for military and commercial aircraft. Hatco also manufactured dielectric fluids, plasticizers and the phosgenated intermediate for "Nutrisweet." After Hatco purchased the facility in 1978, it continued to manufacture a variety of plasticizers, including di-n-butyl phthalate ("DBP"), bis (2-ethylhexyl) phthalate ("BEHP"), diisodecyl phthalate and DOP. Other chemicals that have been used and stored at the site since 1978 include benzene, 1,1,1-trichloroethane, methylene chloride, styrene, xylene and toluene.

In 1983, Hatco modified existing facilities and constructed a new plant at the Fords site to manufacture Z-Aspartic Acid ("ZAA"). These facilities are located in the area of the former benzyl chloride plant.

In May 1984, Hatco closed the sewer line from the west lagoon. The east lagoon sewer line remained operative until both lagoons were taken out of service in 1991 during Project 50. As part of Project 50, Hatco capped the lagoons, creating a physical barrier between the lagoons' PCB-contaminated sludge layer and surface waters, which would otherwise transport PCBs from the sludge to the sewer system.

In 1986 Hatco dismantled the two PA plants at the Fords facility. As a result of the DEP's continued interest in the site, in 1986 Hatco hired Dan Raviv Associates, Inc. (DRAI) to provide advice with respect to the DEP's demands. DRAI installed additional groundwater monitoring wells in 1987, 1990 and 1992, and performed surface and subsurface soil investigations in various areas throughout the site in 1987, 1988, 1991 and 1992. The DEP specified the groups of chemicals to be tested as well as the testing methods. Based on evidence of historical activities at the Hatco site, DRAI created areas of environmental concern (AEC). DRAI also developed a grid system to guide its soil studies. In areas where contamination was found, the density of the grid was increased in order to fine-tune its delineation.

By letter dated December 23, 1987, Hatco notified the Department that the two clay-lined lagoons at the site were only used during periods of intense rainfall when the volume of water exceeded the capacity of the MCUA's underground connecting lines and during any type of disruption of the MCUA underground connecting lines and not for pretreatment of plant effluent. Hatco concluded that as a result no Treatment Works Approval (TWA) or licensed operator were necessary. By letter dated December 31, 1987, the Department replied to Hatco that if the lagoons were not used for pretreatment of plant effluent that no TWA or licensed operator were required but if in the future the lagoons were used to pretreat plant effluent both a TWA and a licensed operator would be required.

Between 1986 and 1992 there were multiple drivers for environmental investigation and remediation which culminated in the 1992 Administrative Consent Order. Work in the K024 area was driven by changes to RCRA that designated K024 material as hazardous waste.

In February 1991, Hatco installed and began operating an effluent pretreatment plant (the "EPT plant") at the Fords site. The main purpose of the EPT plant was to reduce the organics in Hatco's effluent prior to its discharge to the MCUA. Between February 1991 and October 1991, Hatco eliminated the use of all existing in-ground sewer systems which it found to be contaminated with significant levels of PCBs; installed an above ground process discharge system from each manufacturing plant directly to the effluent pretreatment plant; modified existing and installed new sumps and pumping facilities; paved and diked the Ester I tank farm at the site; repaved roadways to divert surface water run-off away from contaminated or process areas; paved the surface above the holding pond areas to prevent contaminated soil from coming in contact with rainfall; installed a new pump at the terminus of the swale collecting surface water along the railroad siding, and hard piped the system directly to the effluent pretreatment plant.

As of the date of the findings of fact (April 29, 1994) Hatco had undertaken four remediation projects: (a) Project 50; (b) Project 51; (c) the removal of PCB-contaminated liquid, including lagoon skimmings, from the site; and (d) the excavation of material from the PA Disposal Area. Projects 50 and 51 took place in and around the Ester I tank farm area (see AOC 9A). The two latter remediation activities were required by Exxon as conditions precedent to its potential purchase of the facility.

URS prepared a draft RAWP for the site on behalf of Grace and Hatco. The draft RAWP, dated March 29, 2001, provided a comprehensive overview of the site and proposed remedial actions for each of the AOCs. Subsequent to the submission of the Draft RAWP to the NJDEP on April 2, 2001, Grace and its affiliates filed Chapter 11 Bankruptcy cases in the United States Bankruptcy Court for the District of Delaware, Case No. 01-01139.

On March 30, 2005, the USEPA issued a Risk-Based PCB Remedy Approval Letter which established threshold PCB concentrations that would trigger remedial action. A copy of the Risk-Based PCB Remedy Approval Letter is provided in **Appendix 1.**

On April 8, 2005 a Natural Resources Damages (NRD) Settlement Agreement was executed for the site by NJDEP and Weston, on behalf of Weston, Grace Chemical and Hatco Corporation. Copies of the NRD Settlement Agreement and related documents are provided in **Appendix 3**.

On April 8, 2005 a Settlement Agreement and a Remediation Agreement were put in place to govern remediation. Copies of these agreements are provided in **Appendices 2 and 4.** The Settlement Agreement transfers to Weston liability for pollution at Hatco that occurred prior to November 4, 2002. Per ACO, Finding 9, "Weston will become responsible for environmental contamination resulting from discharges at or from the Site occurring prior to November 4, 2002." Discharges occurring on or after November 4, 2002, are defined in the RECAPP policy as "New Pollution Conditions." Contamination and effects of continuing discharges prior to this date are defined as "Pre-existing Pollution Conditions."

2.2 KEY DOCUMENT SUBMITTALS

The current analysis of RI completeness relies upon a robust database originally generated by previous investigators and submitted in the following documents that generally address site-wide conditions. Where applicable, Weston has expanded the database to address data gaps and to present complete delineation of the site. Other more AOC-specific documentation is cited and contained in appendices pertinent to individual AOCs.

Copies of the following key site-wide document submittals are referenced within and provided as appendices to this RIR:

- Final Remedial Investigation Work Plan and First Quarterly Progress Report, February 15, 1993 (DRAI, **Appendix 8)**
- Remedial Investigation (RI) Report, May 1993 (DRAI, **Appendix 9)** (Note: This Appendix includes volumes I, III, IV and V. Volume II was not provided and could not be located by Weston.)
- Draft Revised Remedial Investigation Report, August 1994, (DRAI, **Appendix 10)** (Note: This Appendix includes only volume I of II. Volume II was not provided and could not be located by Weston.)
- Phase II Remedial Investigation (RI) Report, November 1995, (DRAI, **Appendix 11)** (Note: This Appendix includes only the text and tables from Volume I and complete Volume III. Neither the figures from Volume I nor complete Volumes II and IV were provided. These could not be located by Weston.)
- 1998 Phase III Remedial Investigation Report (DRAI – presented as an Appendix D to the 2001 RAWP, next item) – **Appendix 15**
- Draft Remedial Action Workplan, March 29, 2001, (URS) – **Appendix 5**

NJDEP approval letters are in **Appendix 7**.

2.3 AREAS OF CONCERN

The 1990s era investigations at Hatco identified Areas of Concern (AOCs). The AOC nomenclature was updated with the submittal of a RAWP addressing all AOCs by URS in 2001;

the AOC references developed in the 2001 RAWP have been adopted for this RIR except for changes as noted and the addition of offsite AOCs 23 (Channels B and C), 24 (Woodbridge Pond) and 25 (Channel D). In addition, underground storage tanks which had not been previously associated with an AOC have been added in as AOC 11B and 11 C. These AOCs were not identified as of the 2001 RAWP.

For each AOC, Weston reviewed the file documentation and developed conclusions regarding the need for additional remedial investigation for each AOC. Discussion of results presented to regulatory authorities (NJDEP and/or USEPA) is in Section 2. New analytical data not yet transmitted to an agency is discussed in Section 7.

In a meeting between the LSRP and Weston's project team on November 16, 2015, it was decided to retain the identity of the AOCs as they have been referenced throughout the case history and in the approved RAWP. It was also concluded that no variance from the current definition of an AOC (N.J.A.C. 7:26E-1.8) is required because a site-wide RAWP from 2001 was approved prior to 2008. Some of the AOC boundaries required adjustment based on additional information acquired after the 2001 RAWP. **Figure 2.3-1** depicts the AOCs.

Where needed to supplement the history of an AOC, historical aerials available at www.historicaerials.com were reviewed and observations noted.

2.3.1 AOC 1: Closed Former Lagoons

2.3.1.1 AOC 1 Description and History

AOC 1 consists of two former lagoons located in the southwest corner of the site. Before they were taken out of service, capped and filled, the lagoons occupied an area of approximately 200 by 320 feet and received influent from the plant's wastewater system, then discharged to the MUA. **Appendix 12** provides a schematic showing the early lagoon operation, as well as cross sections developed during remedial investigations in the 1980s and 1990s. Originally, ester process wastewater was routed to the former ponds (AOC 2) where organics were skimmed and recovered. The remaining wastewater was pH-adjusted prior to discharge to the lagoons where settling and equalization took place. After the lagoons, wastewater was discharged to the public sewer.

These lagoons were clay-lined and constructed in approximately 1966. From 1966 to 1970 the lagoons received effluent from the former pond system as shown in **Appendix 12**.

After the pond system was eliminated in 1970, the lagoons were used for storage of wastewater in the event that the underground lines connecting to the MCUA were disrupted. Between 1984 and 1985, the lagoons were used temporarily for the recovery of organics from process effluents. In 1991, the use of the lagoons was eliminated by disconnecting all lines discharging to the lagoons, redirecting flow to the Effluent Pre-Treatment (EPT) plant, and installing an impervious cover to prevent contaminated sludge from contacting rainfall.

A summary of the use of the lagoons is as follows:

1966 – 1970: Contain Effluent from Former Pond System prior to discharge to MCUA
1970 – 1984: Temporary storage of wastewater in the event that discharge to the MCUA was interrupted.
1984 – 1985: Temporary Use for organics recovery from process effluents
1985 – 1991: Same process as described for the period 1970 to 1984.
1991: Closed by sealing sludge beneath impervious cap and disconnecting lines to the lagoon.
2007 – 2008: Former closed lagoons were remediated by Weston as documented in the Remedial Action Progress Report for the Former Wastewater Lagoons, dated August 2008 (see **Appendix 13**)

Hatco maintained a record of incidents and the reported location of the incident in the plant. One incident was documented at AOC 1 (memo of September 24, 1984 **Appendix 14**). This incident report described a release from the plant to the former lagoons when they were still in service. Because the release was directed to lined lagoons designed to receive, temporarily retain, and transmit wastewater, this release was not considered significant.

2.3.1.2 Previously Reported Investigations

Table 2.3.1-1 and **Figure 2.3.1-1** provide analytical results and show the location of samples collected at AOC 1. Initial SI-phase sampling identified the following contaminants at concentrations above an SCC:

- 1,1,1-TCA (Western Lagoon only)
- Xylene (Western Lagoon only)
- BEHP (both lagoons)
- BBP (both lagoons)
- DNBP (both lagoons)
- DNOP (both lagoons)
- Chromium (Eastern Lagoon only)
- PCBs (specifically Aroclor 1248, both lagoons)

Later sampling between the lagoons and Riverside Drive identified benzo(a)pyrene and benzo(b)fluoranthene above an SCC. Because benzo(a)pyrene and benzo(b)fluoranthene are marginally above the most stringent SCC, are not detected in the lagoon material and are identified in other locations close to Riverside Drive (see AOC 8 and AOC 25, for example), these two PAHs are not considered to be COCs for AOC 1.

Sampling events between the lagoons and Riverside Drive included shallow and deep monitoring well installation, test pits and soil borings for analyses that included VOCs, SVOCs and PCBs. Results of these investigations were reported in the Phase II RIR (DRAI, 1995, **Appendix 11**).

Vertical delineation was demonstrated by the Phase III RIR (DRAI, 1998 – included as Appendix D of the 2001 RAWP, **Appendix 15**), soil borings were drilled at AOC 1 and sampled

at depths ranging from 9.5 to 15.5 feet below ground surface (bgs). Except for the southern edge of the Western Lagoon, delineation was achieved for all COCs at depths of 7.5 to 13.5 feet, with depth increasing from north to south across the lagoons. The only constituent that was not vertically delineated at this location was PCBs. Vertical delineation was later established during supplemental work as described in Section 7.1.1 of this report.

The 2001 RAWP (URS, **Appendix 5**) provided a conceptual site model for the lagoons (AOC 1), former ponds (AOC 2) and muck areas (AOC 2). Based on the results of the 1998 sampling event, the lagoon impacts extended below the clay layer (typically found around 4 to 5 feet bgs in the soil boring logs) but were vertically delineated except for the southernmost soil boring at the Western Lagoon.

Soil borings drilled in 2007 for the purpose of confirming the extent of a proposed site-wide capping remedy were documented in a Remedial Action Progress Report for the Former Wastewater Lagoons (Weston to USEPA Region II, August 2008, **Appendix 13).** According to the report post-excavation samples along the southern end of the lagoons documented PCBs above RDC SCC.

Excavations completed between the lagoons and Riverside Drive (Section 7) completed the RI for AOC 1 along the southern boundary because they removed material that exceeded a standard and the post-excavation data demonstrated that the remaining material did not exceed SCC.

2.3.2 AOC 2: Former Ponds

2.3.2.1 AOC 2 Description and History

This area consisted of four former unlined settling ponds and two former muck storage areas. AOC 2 also includes the undeveloped areas surrounding the former ponds and muck storage areas. The holding ponds were excavated between 1954 and 1961 and received various wastes from manufacturing operations. The ponds were taken out of service and backfilled in 1971. The wastes included spent PCB heat-transfer fluids and process effluent from the Ester I, sebacic acid, and benzyl chloride plants, which included BEHP, diethyl phthalate (DEP), and di-n-butyl phthalate (DNBP). The unlined muck storage areas were formed when sediments, precipitates, carbon residues and filter clays were cleaned out of the unlined ponds and disposed of in these two areas.

The relative locations of the four settling ponds are shown in a historical site sketch dated September 15, 1970 (**Appendix 16).** The following changes were noted in aerial photographs regarding the ponds and muck storage areas:

The area of Former Ponds 3 and 4 is first visible on the aerial photograph dated 1957 as a single pond. The area appears as two distinct ponds in the aerial photograph dated 1963. The ponds were filled in prior to the aerial photograph dated 1972, which is consistent with the reported closure date of March 1971. Former Pond 4 was located beneath the current EPT Plant. Former Pond 3 was located south of the ZAA dryer building. Contaminated material was removed from Former Pond 3 during remediation activities in 2014 (reported separately).

Former Ponds 1 and 2 are not visible in the aerial photograph dated 1957 and are first visible in the aerial photograph dated 1963. This timeframe is consistent with historical records, discussed earlier, that indicate that the pond system was completed prior to 1961. Former Ponds 1 and 2 were filled by March 1971, according to historical records. By 1972, based on the historical aerial photographs, the area was paved and covered by what is currently the ZAA Dryer Building (previously part of the benzyl chloride plant).

The muck areas are first evident in the historical aerial photograph from 1969. They are not visible in the 1963 or earlier photographs. The muck areas appear to have been filled in prior to the 1972 photographs.

The footprints of the 4 ponds and 2 muck areas plus Scrape Area X069, which is about 20 feet west of the former lagoon area, are shown in AOC 2 (**Figure 2.3.1-1**). X069 is located where a linear feature, possibly an old channel, was observed on the 1972 aerial. X069 lies between AOC 1 lagoons and AOC 21A (Channel A). As part of remediation activities conducted by Weston between September 2010 and March 2012 this area was excavated as Scrape Area X069.

AOC 2 was also the location for stockpiling soils excavated during construction projects at the plant; the excavations were overseen by DRAI and stockpile location/volume was recorded on a map, attached to a Hatco memo dated August 25, 1995 (**Appendix 17**).

2.3.2.2 Previously Reported Investigations for AOC 2

Between 1993 and 1998 extensive investigation was conducted at the former pond and muck area. During these investigation soil samples were collected at various depth intervals for VOC+15, BN+15 and PCBs analysis. Monitoring wells and piezometers were installed to characterize groundwater quality and investigate presence of NAPL. These samples were collected primarily to evaluate subsurface conditions and delineate contamination. The results and findings from these investigations were reported in 1995 DRAI Phase II RIR (**Appendix 11)** and 1998 Phase III RIR (**Appendix 15**).

Table 2.3.2-1 provides a summary of the previously collected and reported soil sampling data for this AOC. Sample locations are shown on **Figure 2.3.1-1**.

Three samples collected locations C_8, CA-1 and SC20 were classified as sediment (**Figure 2.3.1-1**) but all other locations were classified as soil.

Sampling results indicated the following compounds above a standard:

- Overall, SVOCs, PCBs and, to a lesser extent, VOCs have impacted AOC 2 primarily in the former ponds, muck areas. Benzene was the most frequently detected VOC in surface and subsurface soils. Only a few slightly elevated concentrations of xylenes, toluene and TCE were found in surface soils.
- Generally, phthalates primarily BEHP, BBP, DEP, dimethyl phthalate, di-n-butyl phthalate (DNBP), and di-n-octyl phthalate (DNOP) have impacted surface and

subsurface soils in AOC 2. BEHP was more frequently detected at all depths than the other phthalates.

- Few samples indicated naphthalene and benzo(a)pyrene above an SCC.
- BEHP and PCBs were the primary COCs.

PCBs and BEHP detections above a standard occur in wide distribution in AOC 2. The contamination identified at AOC 2 has been delineated horizontally and vertically to the RDC SCC: to the west by SB-205, SB-424, SB203, CAP_B-56W, CAP_B-57W-5W, BERM-36, and D11 (these samples are located in AOC 23); to the north by H5, B7 and F6 (these samples are located in AOC 9A); to the northeast by HH-10 located in AOC 4, and F-13, G025-12.75, and H0.75-14.25 (these are located in AOC 9); to the west by G16 located in AOC 5B, and G18 and RR9 located in AOC 3.

To the south of AOC 2, PCB contamination was detected above the NRDC SCC at shallow depth intervals between 1.5 and 2 feet bgs and beyond the property line adjacent to Riverside Drive. This location has been delineated vertically at 7 and 7.5 feet bgs and horizontally delineated by SB434, which is located in the median of the Riverside Drive.

Surface elevation to the north of AOC 2 ranges from 36 to 35 feet above Mean Sea Level (msl), and to the south rages from 26 to 20 feet msl. The elevation at AOC 2 drops towards south by 10 to 16 feet. The deepest PCB contamination exceeding NRDC SCC was identified at MW19S approximately 17.5 feet msl. Vertical delineation is achieved at approximately 12 feet msl at D16, which is located to the southwest of the AOC2. Soil borings drilled at AOC 1 also provide vertical delineation along the southern border.

The RI is complete at AOC 2 based on historical data. The results of the Phase III RIR (DRAI, 1995) were incorporated into the 2001 RAWP (URS), which was accepted by NJDEP and became the basis of the Settlement Agreement.

In 2014 and 2015, Weston implemented the majority of a remedial action of the Southeast Leg area, which is located within AOC 2. (Limited restoration activities were still in progress at the time this RIR was prepared in May 2016.) Results of that work will be reported separately. Post-excavation sampling conducted during the Southeast Leg remedial action confirmed the historical delineation was complete within the footprint of mapped AOC 2. Limited additional sampling was required to delineate PCB impacts within this area. The additional sampling was performed in accordance with supplemental SAP dated March 14, 2016 (**Appendix 18**).

2.3.3 AOC 3: Rail Siding Area

2.3.3.1 AOC 3 Description and History

This AOC is the railroad siding areas, which run from the southern edge of the property near the lagoon to the northeast corner of the Ester I complex. Manufactured products and raw materials were pumped to/from the transfer facilities to rail cars. Leaks and spills of materials during pumping/transfer have occurred in this area and are described in Hatco's facility incident

records. The following are referenced to AOC 3. Copies of the release records are in **Appendix 19**.

Materials released included BEHP, fatty acids, wastewater, TCE and organic liquids in the vicinity of the Ester II siding, phthalic anhydride (a solid) and DIDP.

2.3.3.2 Previously Reported Investigations

Table 2.3.3-1 and **Figure 2.3.3-1** show the data and sampling locations discussed below.

Environmental investigations from 1988 to 1994 were reported in DRAI Draft Revised RIR (1994, **Appendix 10**). Early sampling events included a full suite of analyses in this area – VOCs, SVOCs, PCBs and metals. The 1994 Draft Revised RIR identifies COCs for this AOC as:

- BEHP
- PCBs
- Arsenic
- Lead

On April 28, 1993, preliminary sampling was conducted in an area where construction of a spill containment structure was planned in order to characterize the soil so that it could be managed appropriately during the excavation (note: these sampling locations are shown in **Appendix 9**; because they were not part of the environmental investigations, they were not included in the database information plotted on **Figure 2.3.3-1**). In addition, the soil characterization was to ensure that no further remedial action would be required after the spill containment structure was constructed. After the soil excavation was performed, post-excavation samples were also collected to verify removal of contaminated soil.

The excavation was reported in a letter report of December 3, 1993 (**Appendix 20**). The final excavation was about 400 feet long by 20 to 23 feet wide by 2.5 to 3 feet deep. The area is now covered by a concrete containment structure.

Additional soil borings drilled by DRAI in 1998 and were reported in the Phase III RIR, as Appendix D of the RAWP (URS, 2001 – **Appendix 5**). As shown in **Table 2.5.3-1** the roadway median sample SB431 completed the horizontal delineation for PCBs to the south.

In 2007, soil samples were collected from 28 locations **(Figure 2.3.3-1).** Results from the 2007 sampling were submitted to NJDEP on December 17, 2008 (**Appendix 29**) and incorporated into the RAWP Addendum No.3, which was approved by NJDEP.

Based on previously submitted data (2007 and earlier), delineation of AOC 3 at the southern edge of the site is complete.

With regard to vertical delineation within AOC 3, several soil borings included depth profile sampling to depths below 3 feet bgs. In some areas delineation is achieved by 3 feet depth; in other areas impacts up to 9 feet are documented by sampling.

No sampling data that has not been previously reported was required to complete the delineation of AOC 3.

2.3.4 AOC 4: Ester 1 Building and Acid Tank Farm

2.3.4.1 AOC 4 Description and History

Based on information provided in the Draft Revised RIR (DRAI, 1994, **Appendix 10**), AOC 4 is the Ester I building and the surrounding area. At Ester I, plasticizers, dielectric fluids and phenylxylylethane (PXE) are produced from phthalic anhydride. Production of PXE was terminated in early 1994. Hydrotherm Units No. 1 and No. 2 were located on the south side of the Ester I building in the 1960s. Between approximately 1960 and 1966 these units used heat transfer fluids that contained PCBs.

AOC 4 includes the following:

- Ester I process building
- Two warehouses
- Hydrotherm building
- Therminol drum storage outside the Hydrotherm Building.
- Catch basin next to the tank farm (DRAI identified product and noted it as a source of PCB impacts.)
- Fuel Oil AST
- Acid Tank Farm
- Loading/Unloading along the railway

The northernmost portion of this AOC is not accessible for sampling due to active process areas. The southern tank farm area has been sampled via soil borings, but is also limited access due to numerous ASTs of varying sizes and overhead piping.

Facility records documented two releases for AOC 4 (**Appendix 21**).

2.3.4.2 Previously Reported Investigations for AOC 4

Numerous soil borings were drilled at AOC 4 in 1992, including investigation of a non-aqueous phase liquid (NAPL) around the Hydrotherm building. The July 1992 assessment of PCB contamination in and near the Ester-I Tank farm confirmed the presence of high-level concentrations of Aroclor 1248, being detected on sampled surfaces and in the soil and ground water media. Seepages near the tank farm represent mobile PCB contamination, which is being transported to the south into adjacent soils via surface water runoff. Concrete samples inside the Hydrotherm building are designated as "(CORE)" on **Figure 2.3.3-1**; these samples confirmed spillage inside the building. Data is presented in **Table 2.3.4-1**.

The following compounds were identified above RDC SCC in the 1992 sampling:

- Benzene (2 locations)

- Trichloroethene (1 location, above RDC SCC in the saturated zone)
- Xylenes (1 location, above IGW SCC in the unsaturated zone)
- BEHP
- DEP (1 location, above IGW SCC in the unsaturated zone)
- PCBs

The most widespread COC is PCBs. The other constituents are present in a relatively small area based on other soil borings in this AOC and adjacent AOCs.

PCB concentrations indicate that AOC 4 is a source area; the highest PCB concentrations are in the saturated zone (about 16 feet bgs) and are vertically delineated by 23.5 foot depth samples.

A soil boring at the northwest corner of AOC 4 (A4.75) provides upgradient delineation for PCBs, SVOCs and VOCs identified in other soil borings at AOC 4. However, this soil boring is impacted with xylenes above RDC SCC at the 6-foot depth interval (vertically delineated at 10 feet bgs. These investigations are reported in the Phase II RIR (**Appendix 11**).

The 1994 Draft Revised RIR (DRAI, **Appendix 10)** documents facilities expansion/improvement projects in AOC 4. For each project, DRAI sampled soils in the area to characterize them for excavation and disposal (as required), then confirm the outcome of the remediation by post-excavation soil sampling. DRAI completed reports to document each project:

Truck Transfer Station (Report of November 14, 1994, **Appendix 22**)

In order to construct a new truck transfer station, an area of 26 by 10 feet by 2 feet deep was excavated and post-excavation soil samples collected.

NAPL Delineation in the Vicinity of the Hydrotherm Building (Report of December 22, 1995, **Appendix 23)**

Between May 1993 and June 1994, monitoring wells and four borings were installed to delineate LNAPL. A product recovery system was installed in well MW -15s as an IRM.

Ester I Expansion (Report of February 22, 1995, **Appendix 24**)

Several small excavations were conducted at several locations within the facility include a transformer pad (AOC 12F), acid tank farm (AOC 4) – very small soil removal to install footings, hopper waste pad (AOC 9A), a natural gas pipeline (AOC 9C) and a reactor in the Ester I building (AOC 4). The Ester I building excavation involved removing a 30-foot diameter circle of concrete, excavating 8 inches in depth, and covering the area with concrete.

Hydrotherm Building Addendum (Report of March 20, 1995 **Appendix 25**)

This addendum provides additional information on the NAPL and references a source area within AOC 4. Aroclor 1248 was detected at 3,500 ppm, and Aroclor 1254 at 350 ppm in the free product sample from MW15S.

Investigations at the Hydrotherm building and the Ester I tank farm confirmed that these areas are a source of PCB impacts, but vertical delineation sampling confirmed that the extent of impact above SCC does not exceed 23.5 feet bgs. PCB and SVOC impacts are delineated to the north and east but not to the south and west within AOC 4. Areas to the south (AOC 19) and west (AOC 2) have been extensively sampled and provide delineation for AOC 4, including VOCs. The RI is considered to be complete for AOC 4.

2.3.5 AOC 5: Ester II and Areas East and South

AOC 5 was subdivided into two separate AOCs – 5A on the east side of the railroad tracks and 5B on the west side of the tracks. AOC 5A is an "internal" AOC (bounded by other AOCs except for the southern boundary with Riverside Drive (**Figure 2.3.3-1**).

AOC 5A includes the following:

- Ester II Plasticizer Building
- 3 ASTs west of Ester II, adjacent to the rail siding
- A fuel oil AST (southwest of Ester II)
- A heating oil fired heater (southwest of Ester II)
- 3 Cooling Towers (south of Ester II)
- An AST Tank Farm east of Ester II
- A large 2EH (BEHP) AST with bermed containment
- Two large ASTs in a bermed containment for storing DOP
- Open areas adjacent to the rail siding (west) and AOC3 13 and 8 (east)

Figure 2.3.3-1 shows these features and the samples collected at this AOC.

Releases were indicated in the Hatco files for the vicinity of AOC 5A **(Appendix 26**). The incidents involved DIDP, esters, decyl alcohol and contaminated soil and trash. These releases appear to be limited in duration and volume; facility cleanups are reported. Investigative sampling has occurred in the areas indicated by the spill descriptions.

2.3.5.1 Previously Reported Investigations at AOC 5A

Due to the large area of this AOC, a significant number of samples have been collected in this area beginning in 1987 and continuing to the present (1993 RIR, 1995 Phase II RIR, 1995 Phase III RIR, 2001 RAWP – **Appendices 5, 9 and 97**). Because AOC 5A is contiguous to other AOCs 3, 9C, 13 and 8 (**Figure 2.3-1**), the issue of a complete RI will focus on the southern property line with Riverside Drive and vertical delineation. The 1990s era RIR data were incorporated into the 2001 RAWP (URS) that was approved by NJDEP for the Settlement Agreement (2005).

Table 2.3.5-1 provides a summary of all of the sampling data for this AOC. Various samples have been analyzed for VOCs, SVOCs, PCBs and metals, particularly in initial sampling rounds. Most samples were analyzed for SVOCs and PCBs. Sampling results indicated the following compounds above a standard:

- PAHs typically indicative of fill material and/or railway related impacts – benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene, benzo(k)fluoranthene
- Naphthalene (1 sample)
- BEHP and PCBs

The samples with PAHs above an SCC are located along the railway with the exception of 116(FF 18.5) which is in the middle of the yard.

Naphthalene is limited in extent and delineated horizontally and vertically to 6.5 feet by samples within AOC 5A.

BEHP is delineated along the southern boundary of AOC 5A by G21, 157(A/F20.75) and GG21. The highest BEHP concentrations occur around the DOP ASTs, within the secondary containment (Scrape Area X029). Vertical delineation is achieved by 10 to 12 feet depth. Some LNAPL was observed in this area (LNAPL discussion, Section 11.2).

The southern extent of PCBs is horizontally delineated by soil borings drilled in the median of Riverside Drive (SB428 and SB429). These locations are progressively further from Hatco and indicate PCB concentrations between RDC SCC and NRDC SCC (SB428) and concentrations below RDC SCC (SB429 – farthest out from Hatco).

Remedial excavation X042 achieved vertical delineation of the PCBs at the southern side of AOC 5A at a depth of 5 feet below grade (Section 7 of this RIR). After this excavation, the RI was considered to be complete for AOC 5A.

2.3.5.2 AOC 5B – Truck Loading Rack

Table 2.3.5-2 presents data for sampling conducted in AOC 5B and **Figure 2.3.3-1** shows the location of samples.

One incident involving di-isodecyl phthalate was recorded in Hatco's files for AOC 5B (**Appendix 27)**.

2.3.5.3 Previously Reported Investigations at AOC 5B

The three downslope sides of the truck loading rack were investigated by soil borings (DRAI, 1995 Phase II Remedial Investigation Report, **Appendix 11**). Initial sampling events included analysis for SVOCs and PCBs; BEHP and PCBs exceeded SCC. Surface soil sampling indicated surficial release. At soil boring G16 the vertical extent of impact was delineated at 1.5 to 2 feet bgs.

Additional soil borings drilled in accord with an NJDEP-approved 2006 RIWP completed the delineation of PCBs to the east. Soil sample G17, located outside and downslope of AOC 5A also provides delineation for PCBs. Delineation to the west is discussed as part of AOC 2, which

is contiguous to AOC 5B. Delineation to the southeast (AOC 3) is demonstrated by SB298 and downslope vertical delineation of a depth of 3.5-4 feet bgs.

Based on sampling data from 2007 and prior, the RI is complete for AOC 5B.

2.3.6 AOC 6: Phthalic Anhydride Process Area

2.3.6.1 AOC 6 Description and History

According to the Draft Revised RIR (DRAI, 1994, **Appendix 10**), the original phthalic anhydride (PA) process unit was constructed in approximately 1961 with a second unit added in approximately 1963. The first unit produced phthalic anhydride using naphthalene as the feed stock. The process generated distillation bottoms containing acenaphthylene, pyrene, phenanthrene, isophorone and others. The second unit used coal-tar derived feed, which produced residues containing picolines, quinolone, phenol and cresols. According to an NJDEP inspection memo appended to a November 19, 1981 document, the PA plants were shut down in 1971, leaving the contents of kettles, tanks and reactors in place. Demolition was scheduled for completion in 1986. The NJDEP memo noted that phthalic esters, monohydric alcohols and phthalic anhydride were reacted in this area and Mobiltherm™ oil was used for heating.

The PA Process Area included 2 plants, three phthalic anhydride heaters, a hopper for waste, a drum storage area and ancillary structures such as the engineering building, fire house and trailers. The AOC is roughly 260 by 275 feet.

Facility records include one incident involving a phthalic anhydride solid at AOC 6 (September 25, 1987, **Appendix 28**).

AOC 6 is internal to the facility, entirely surrounded by other AOCs (**Figure 2.3-1**).

2.3.6.2 Previously Reported Investigations for AOC 6

Figure 2.3.3-1 and **Table 2.3.6-1** summarize prior data. Previous reporting for this area included:

- Revised Draft RIR (DRAI, 1994, **Appendix 10**) – this included supplemental soil borings in an area where a concrete pad for a waste hopper was to be built –soil borings indicated impacts from Aroclor 1248 at concentrations above NRDC SCC
- Phase II RIR (DRAI, 1995, **Appendix 11**)
- Phase III RIR (Appendix D of the RAWP, URS, 2001, **Appendix 15**)
- Results from Weston's 2007 sampling were submitted to NJDEP on December 17, 2008 (**Appendix 29**). These results were incorporated into Addendum No. 3 to the Consolidated RAWP (2009), which was approved by NJDEP.

These sampling events identified the following compounds in excess of a standard:

- Benzo(a)anthracene, benzo(a)pyrene and chrysene –in subsurface soils (below 2 feet) and located on a slope up to the PA area
- BEHP (1 sample) – eastern side of PA area
- Naphthalene – 5 samples, present at depths up to 5 feet bgs

- PCBs – most widespread

Based on the previously reported sample data, AOC 6 delineation is sufficiently complete to proceed with remedial design. Available soil logs and sampling indicate that the PCB and naphthalene impacts are limited to the top 5 or 6 feet of soil (or less). Two samples on the eastern side of AOC 6 indicate exceedance of PCB and SVOCs; these locations are delineated by AOC 7A and the excavations conducted there, as discussed below.

The RI is considered to be complete for AOC 6.

2.3.7 AOC 7A: Phthalic Anhydride Residue Area

2.3.7.1 AOC 7A Description and History

The Draft Revised RIR (DRAI, 1994, **Appendix 10**) provided the following information regarding AOC 7A.

AOC 7A is the phthalic anhydride residue area, also referred to in past reports as the K024 area, which is located east and south of the former phthalic anhydride manufacturing facility. The distillation bottoms from the phthalic anhydride process were deposited in this area. Analytical results for soil samples collected from AOC 7A during March 1988 indicate the presence of naphthalene and K024, an EPA-listed hazardous waste. Specifically, the waste code K024 was defined as "Distillation bottoms from the production of phthalic anhydride from naphthalene." (www3.epa.gov/epawaste/inforesources/data/br91/na_apb-p.pdf).

The phthalic anhydride process areas are initially visible on the 1963 aerial, but no evidence of onsite disposal is observed at that time. In the 1969 aerial, blackened areas are visible in AOC 7A. By the 1979 aerial, small buildings (trailers?) and piles of debris are visible throughout the area. In the 1987 aerial the phthalic anhydride process equipment is gone and the area has been graded. In the 1995 aerial, a large pond is visible (the pond is the remnant of the excavation described below).

2.3.7.2 Previously Reported Investigations

Figure 2.3.7-1 and **Table 2.3.7-1** show the sample locations and analytical results discussed in this section.

Soil samples from pre-excavation soil borings (1987 and earlier dates on **Table 2.3.7-1**) were analyzed for VOCs, SVOCs, PCBs and metals. Results identified the following compounds above an SCC:

- BEHP
- Naphthalene

Because of the observation that an EPA listed waste was present remedial action proceeded quickly.

1988 Remedial Action

- August 29, 1988: Post Excavation Sampling Plan (DRAI, **Appendix 30)**
- September 12, 1989: NJDEP Approval

Also according to the Draft Revised RIR (DRAI, 1994 **Appendix 10**), between July 12 and August 11, 1988 approximately 18,000 cubic yards of hazardous material were excavated from AOC 7A. The final excavation was divided into two sections, the larger section was excavated 8 to 10 feet deep where a natural gray clay layer was encountered. In the smaller area, the excavation ranged from 0 to 5 feet in depth where a red-brown silty clay was encountered. The thickness of the phthalic anhydride residue decreased within the southern portion of the excavation from about five feet to nothing along the southern border of the excavation. DRAI field notes from July 19, 1988 confirmed that the gray clay layer was punctured in the northern section of the excavation. Beneath it was gray, well sorted medium sand. Artesian conditions exist beneath the clay.

Post-Remedial Action Sampling (1988 and 1989)

The excavation was conducted so as to preserve the integrity of the clay. Post-excavation soil samples were analyzed for SVOCs and, in a few cases, PCBs and metals. Soil samples were collected via hand auger in the natural clay at the base of the excavation ("B" locations). Soil samples were also collected in the sidewalls of the natural soil, typically at the interface between the overlying soil and the clay. Some sidewall samples were also collected in the soils higher on the sidewall. Bottom samples were analyzed for BNs and sidewall samples were analyzed for both BNs and PCBs. The soil sampling confirmed that naphthalene concentrations remained above RDC and NRDC SCC at the bottom of the excavation (depths of 8 to 10 feet) and PCBs above SCC were also present.

In summary:

- Northern sidewall: PCBs and naphthalene exceeded SCC (naphthalene also exceeded SRS in the bottom sample of the excavation).
- Eastern sidewall: The excavation extended close to Sling Tail Creek and the Draft Revised RIR noted that no further excavation would be conducted because of encroachment on the creek. PCBs, naphthalene and BEHP exceeded SCC/SRS in the eastern sidewall.
- Southern sidewall: soil sampling locations confirmed COCs below SCC (and SRS for naphthalene).
- Western sidewall: PCBs, naphthalene and BEHP remained above SCC.

This AOC is contiguous to AOC 14 (north), AOC 6 (west) and AOC 13 (south) as shown on **Figure 2.3-1** and data from these areas can be used to complete the delineation.

Additional remedial excavation with post-excavation sampling was conducted in 2012 and 2104, as described in Section 7, which completed the RI for this AOC.

2.3.8 AOC 8: Tarry Area

AEC 8 is referenced as "the tarry area," located on the southeast corner of the site adjacent to Riverside Drive. The AOC name relates to a black, viscous material observed in this area. According to the Draft Revised RIR (DRAI, 1994, **Appendix 10**), a tar-like substance found in the subsurface soil is attributed to road construction waste generated from the construction of Riverside Drive.

Comparing the 1979 aerial (pre-Riverside Drive) and the 1987 aerial (post-Riverside Drive), the site's driveway was realigned and a swath of land along the old Industrial Avenue that was undeveloped frontage became the westbound lanes of Riverside Drive. The western boundary of AOC 8 is approximately the edge of the former site driveway. There may be some debris present after the construction (in particular, a large white area which may be concrete is visible), but the photo resolution is not sufficient to distinguish scattered surficial debris if it were present.

AOC 8 was not actively used (no structures are observed in the area) and there are no records of spills in this area.

2.3.8.1 Previously Reported Investigations

Table 2.3.8-1 provides the data for sampling events within the AOC and **Figure 2.3.7-1** shows the location of the samples collected.

The Draft Revised RIR (DRAI) describes investigations completed up to 1994. Soil samples collected at AOC 8 were analyzed for SVOCs, VOCs, PCBs. Compounds exceeding a standard were BEHP, PCBs and naphthalene.

Soil borings where vertical delineation was achieved confirmed impact to depths of 1.5 to 2 feet below grade. DRAI noted that depth to water ranged from 7 to 10 feet below grade.

In a letter of April 22, 1996, NJDEP commented on the DRAI Phase II RIR and noted that delineation of the western limit of BN contamination in AOC 8 should be completed (other directions were acceptable).

Soil samples were then collected to delineate the west side of the AOC and BEHP and naphthalene were found above NRDC SCC. These areas were vertically delineated at 2 feet depth.

Remedial excavation/post-excavation sampling was completed at AOC 8 (Section 7) and is used to complete the delineation.

2.3.9 AOC 9A: Ester 1 Tank Farm

2.3.9.1 AOC 9A Description and History

AOC 9A is located in the main manufacturing area. According to an NJDEP inspection report (appended to a November 19, 1981 memo, **Appendix 31**), the Ester I area produced synthetic

lubricants by mixing various grades of fatty acids (containing 5 to 10 carbons) with heavy alcohols (containing at least 10 carbons) to produce synthetic esters via a process called esterification. The NJDEP inspector noted that heptanoic and valeric (aka pentanoic) acids were major components used in Ester I. AOC 9A is the tank farm used to contain compounds for the Ester I processes and products.

The Ester I process generated a phthalate filter cake that contains BEHP as well as spent activated carbon used to remove impurities such as trace metals, plus diatomaceous earth and lime used to remove fatty acids. The filter cake was stored outside in a roll off, then shipped offsite for disposal under manifest. Based on facility drawings, it appears that the roll off was located at the TA3 Transfer Area (**Figure 2.3.1-1**).

According to a 1993 RIWP (DRAI, **Appendix 8**), prior to 1966 heat transfer fluids containing PCBs were used in hot oil heating systems in the Ester-1 production area, which includes the Ester-1 building (AOC 4), the Ester-1 tank farm (AOC 9A) and the Hydrotherm Building (AOC 4).

Field notes indicated storage of styrene and phthalic anhydride (both in solid phase) in drums at the southeastern corner of AOC 9A. According to "Existing Sewers and Drainage Trenches" (Straubing & Rubin, June 14, 1976, **Appendix 33**) grates and drains exist down the center of AOC 9A; these connect to the plant's sewer system and eventually to the MUA. Spill reports (discussed below) reference this sewer system.

The following features are or have been present in AOC 9A (with the names of samples that were located in that area following):

- Transfer Area TA2 (north side of tank farm) – H/G4.75
- Transfer Area TA3/hopper area – F5, F6 and F7
- Transfer Area TA5 – MW37S (a well) and 104(F/G 7.75)
- Drum Storage Area – G9 (immediately downgradient)
- Overhead piping to the railway – G7, F7
- Overhead piping to the Alcohol Tank Farm (AOC 9B)
- ASTs (approximately 60) – G6, H5, B7, H7 and G7

Records of releases were found in the site's files for the Ester I tank farm (**Appendix 34**). The releases involved TOTM, Hatco-1570, Hatco 2850 (synthetic compressor oil), ester of neopentyl glycol, unknown material, isopentanoic acid, valeric acid, hexanoic acid, and C8/C10 fatty acid.

2.3.9.2 Previously Reported Investigations

Initial analyses at AOC 9A identified the following COCs for this area (**Table 2.3.9-1**):

- Benzene (above IGW SCC)
- 1,2-DCE (above IGW SCC)
- BEHP (above NRDC SCC)
- PCBs (above NRDC SCC)

One sediment sample was also collected from AOC 9A (**Table 2.3.9-**2). In January and February 1991, DRAI conducted a soil boring investigation in the Ester-I tank farm area (Project 50, reported in Summary of RI/FS Scoping Investigation Results, November 6, 1992, **Appendix 32**). Aroclor 1248, a PCB compound, was detected in all but one sample at concentrations ranging from 0.14 ppm to as much as 94,000 ppm. Aroclor 1254 also was reported in several sample locations, at concentrations varying from.0.32 to 110 ppm.

In monitoring well MW17S, located about 50 feet from a reported seepage pathway from the Ester I Tank Farm, 3,800 ppm of Aroclor 1248 and 449 ppm of Aroclor 1254 were detected. Monitoring wells MW17S and MW15S both had product, initially observed in 1992.

These sampling events demonstrate high-level contamination of PCBs near the tank farm, along the macadam and in on-site soils and ground water. DRAI concluded that seepages downgradient/south of AOC 9A and 10C were evidence that the release of PCB compounds into the environment was continuing at the time of their investigation in the early 1990s. These issues were delineated and addressed as part of the LNAPL investigation (Section 5.2)

Soil samples on the northern side of Ester I tank farm indicated surficial PCB impact, which was delineated by 1.5 feet depth.

Soil borings within and along the eastern and western sides of the tank farm indicated delineation of PCB and BEHP impact by 7.5 feet depth.

Delineation at AOC 9A is achieved by surrounding AOCs (**Figure 2.3-**1) as well as the LNAPL investigation (Section 5.2) and the RI is considered complete.

2.3.10 AOC 9B: Alcohol Tank Farm

2.3.10.1 Description and History

The alcohol tank farm was constructed in the 1960s on top of a former pond. In the 1954 aerial the area which became the tank farm is light-gray and may possibly be a shallow pond or low area. In the 1957 aerial the same area is clearly a pond. By the time of the 1963 aerial, the area is filled and graded and in the 1969 aerial the tank farm apparatus has been installed.

The Alcohol Tank Farm supports operations on Ester I, and it is located in the production area, shown on **Figure 2.3-1.** According to an NJDEP Facility Inspection (November 19, 1981, **Appendix 31**), the Ester I process utilized heavy alcohols containing at least 10 carbons in their structure. The Ester I Alcohol Tank Farm includes the following features (with samples that assessed the feature):

- Seventeen ASTs (labelled tanks include T137, T150, T151 and T152, DPCC/DCR Plan, January 21, 2005) – SB252, H4, SB251, G4.25, SB250, A4.25 and A4
- Loading Rack – B4.25
- Cooling Towers (designated CT-1 and CT-5) – 102F/G

- Two Transformers (designated UE-4B and UE-5B – these will be addressed as AOC 12) – H4.5
- Two Caustic ASTs (indicated as 50% NaOH, on the DPCC/DCR Plan, January 21, 2005)
- Alcohol Tank Farm Drum Storage (shown on DPCC/DCR Plan, August 1, 1992) – G4.5

The tanks are located on a gravel pad and contained by concrete (DRAI, 1993) and the enclosed tank farm is about 160 by 200 feet in area. The AOC is bounded by the tank farm containment wall (**Figure 2.3.10-1**).

Incidents/releases have been recorded for the perimeter of AOC 9B (**Appendix 35**). These involved o-xylene, BEHP, tridecanol and caustic material. Each of the incidents resulted in a release to asphalt with no record of soil impacts. The incidents were short-duration, known compounds, generally in small quantities, and cleanup occurred immediately after the incident, according to company records.

2.3.10.2 Previously Reported Investigations

Table 2.3.10-1 summarizes data for the AOC and **Figure 2.3.10-1** shows sample locations.

In 1992, DRAI collected soil samples from within the tank farm enclosure (**Appendix 9** – Remedial Investigation Report, May 1993, DRAI). Analysis included VOCs, BNs, AE-SVOCs, PCBs, TPH, sodium and chloride. The sample results are summarized in **Table 2.3.10-1**.

The 1993 RIR (**Appendix 9**) stated that one PCB "hot spot," consisting of Aroclors 1248 and 1254, was found at the surface and one slight exceedance was found at a depth of 8 feet bgs (both of these samples were from soil boring H4.5). The RIR further noted that the elevated PCB concentration may be due to the close proximity of this location to AOC 12 (transformers). According to DRAI reports discussed for AOC 4, the area of H4.5 was excavated.

The 1993 RIR further stated that VOCs, BNs and PHCs have not impacted AOC 9B. Therefore, this area is considered to be of low environmental concern.

The Phase II RIR (DRAI, 1995, **Appendix 11**) concluded that, based on the Phase I RI conclusions, AOC 9B was delineated. The 1990s RIR work was incorporated into the 2001 RAWP (URS), which was accepted by NJDEP as the basis for the 2005 Settlement Agreement.

BEHP concentration exceeded RDC SCC at G4.25 at a depth of 0-0.5 feet. This location is delineated via soil borings SB251, SB250 and 102F/G. Depth profile samples were not collected at G4.25 but were collected at nearby soil borings; results indicate that the BEHP concentration is limited in extent.

No other concerns were identified in the sampling for this AOC; RI for soils is complete.

2.3.11 AOC 9C: Naphthalene Tank Farm

2.3.11.1 AOC 9C Description and History

This AOC consists of four ASTs used to store naphthalene. The area has four earthen containment berms that occupy an area of approximately 250 by 230 feet. The tanks are connected to Ester II and the Acid Tank Farm via overhead piping. They are bounded to the west by a rail spur. Two former phthalic anhydride process areas were located to the north before they were dismantled.

The ASTs were first visible on the 1963 aerial, indicating a late 1950s/early 1960s construction date. A Straubing & Rubin "Existing Sewers" Drawing from June 14, 1976 (**Appendix 33)** identifies the four tanks as Tank A, Tank B, Tank 7100A and Tank 7100B with a label indicating naphthalene storage.

Subsequent to cessation of phthalic anhydride manufacturing, the tanks were used to store recycled organics, off-grade esters, and No. 6 fuel oil. In addition, three of the four tanks received lagoon skimmings in 1984. The tanks were cleaned in 1988 and hazardous waste generated was disposed offsite. **Figure 2.3.3-1** shows the tanks.

No releases were recorded in the Hatco records for this AOC.

2.3.11.2 Previously Reported Investigations

Table 2.3.11-1 and **Figure 2.3.3-1** summarize soil sampling data collected at this AOC. Based on all sampling events for this AOC, COCs are:

- PCBs
- BEHP
- Naphthalene

At the surface, concentrations of SVOCs (specifically BEHP and naphthalene) and PCB Aroclor 1248 exceed NRDC SCC. One beryllium and zinc "hot spot" was found at the surface, but no other typical site COCs (BEHP, naphthalene or PCBs) were found in association with beryllium (1993 RIR, DRAI **Appendix 9**). For this reason beryllium and zinc were not considered to be a COC for this AOC. However, other samples in the area at the same depth (U26, S/T26, T/U26 and V26) had beryllium and zinc concentrations below SCC. None of these provided vertical delineation. Sample 124(P26.25) from AOC 7A had a deeper sample collected at 11-11.5 ft bgs that had beryllium and zinc results below SCC. No other deeper samples in the area were analyzed for metals. These samples provide a large-scale delineation.

In subsurface soils, naphthalene and BEHP were detected in excess of the SCC.

Between 1993 and 1994, soil samples were collected in the western corner of AOC 9C to characterize soil quality prior to building a transfer station (Draft Revised RIR, August 1994,

Appendix 10). Samples were collected at a depth of up to 4 to 4.5 feet and analyzed for PCBs and BNs. None of the analytes exceeded the SCC.

As part of planned natural gas line construction, soil samples were collected along the eastern and northeastern perimeter of AOC 9C; these samples found PCBs above NRDC SCC. This sampling was to characterize soil quality where a gas line was to be installed.

In the 1995 RIR, (DRAI Phase II RIR, November 1995, **Appendix 11)** concluded that impacted areas within 9C were delineated and were restricted to areas inside of the tank berms. In a letter of April 22, 1996, NJDEP disagreed that overhead piping areas at AOC 9C were delineated. Soil samples along piping runs (**Figure 2.3.3-1**) were delineated to the north, east and south by other samples except for the lowest piping run (associated with tank M-1D/7100A), which is assumed to be delineated by the berm itself. To the west, delineation is based on samples collected at AOC 3 (railway). Depth samples collected within the tank farm indicate delineation by 3 feet except at one location which required sampling to 6 feet bgs. Additional sampling data for this AOC was reported to NJDEP on December 17, 2008 (**Appendix 29**). This data was incorporated into Addendum No. 3 to the RAWP (2009), which was approved by NJDEP.

The area of PCBs in excess of 100 mg/kg that was identified in association with overhead piping at the northeast corner of AOC 9C is limited in extent based on the 2007 sampling to the east and prior sampling within AOC 9C to the west and south. Because the PCB-impact at this area appears to be related to above-ground piping as a surface release and a downward concentration gradient is observed, the vertical extent of impact is projected to be approximately 8 feet based on the concentration trend in SB307. RI is considered to be complete for AOC 9C, including the overhead piping area.

2.3.12 AOC9D: Scales Tank Area

2.3.12.1 AOC Description and History

AOC 9D consists of three product tanks T147 to T149 which stored plasticizers and lubricants. These tanks are used to load tank trucks and, occasionally, railroad tank cars via overhead piping. A scale is located immediately east of the tanks (also part of AOC 9D) as well as a loading rack (not considered part of AOC 9D).

As observed on historical aerials, the AOC 9D tank farm was constructed between 1963 and 1969. Prior to construction, the area was wooded. There are no releases recorded in Hatco's records for this AOC.

2.3.12.2 Previously Reported Investigations

When DRAI sampled this AOC in 1992 (RIR, **Appendix 9**), no previous sampling and analysis had been conducted in this area. A 50 by 50-foot grid was used at the scales tank area (AOC 9D). Surface (1.5 to 2.0-feet depth) and subsurface (4.0 to 4.5-feet depth) samples were collected from five soil boring locations. The depth to water in this area is approximately 8 feet below grade. Sampling locations are shown on **Figure 2.3.10-1** and data are summarized on **Table 2.3.12-1**.

In AOC 9D, three "hot spots" of PCBs were detected, 2 in the surface and one in the subsurface soils to a depth of 4 feet bgs. VOCs, SVOCs and PHCs were not reported above SCC. This area was considered to be of low environmental concern by DRAI.

1993 Sampling

In anticipation of the need to construct Secondary Containment for the Scale House Tanks, soil borings were completed and sampled to further characterize subsurface conditions in the Scales Tank Area in August 1993 (**Appendix 36**).

2007 Cap Extent Verification Sampling (**Appendix 37**)

Based on the NJDEP-approved SAP dated November 14, 2006, samples were collected at locations around I4.0 for delineation at AOC 9D.

2011 Receptor Evaluation

In 2011 a soil gas sample was collected from the scale house (SH-SG); the details of this sampling event are provided in Section 9.4 – Vapor Intrusion.

Locations C4 and C4.5 (**Figure 2.3.10-**1) provide delineation to the west for AOC 9D. RI for this AOC is considered to be complete with historic data.

2.3.13 AOC 9E: No. 6 Fuel Oil ASTs

2.3.13.1 AOC 9E Description and History

AOC 9E includes two No. 6 oil ASTs and a 2,000-gallon gasoline UST. The area is located north of the maintenance building (**Figure 2.3.13-1).** The largest No. 6 oil tank is approximately 27 feet in diameter and the smaller tank is about 10 feet in diameter. The AST is initially visible in 1957 and above-grade piping to the maintenance building, then out to the boiler building can be seen in the aerials. According to the Draft Revised RIR (DRAI, 1994), the tanks are located within an earthen floored secondary containment dike with a storage capacity of about 90,000 gallons. Dike walls are masonry block. Facility personnel interviewed by NJDEP indicated that fatty acids and heavy alcohol waste generated in Ester II was mixed with No. 6 fuel oil and burned in the facility's boilers until circa 1983 to 1984 (**Appendix 10)**

Two No. 6 Oil release incidents were reported in Hatco records for AOC 9E (**Appendix 38**).

2.3.13.2 Previously Reported Investigations

Initial soil sampling events at this AOC were reported in the 1994 Draft Revised RIR (DRAI, **Appendix 10**). **Table 2.3.13-1** summarizes soil data for this AOC.

In 1994, as part of planned construction of secondary containment in this area, soil borings were drilled and sampled at a depth of 1.5-2 feet. PCB and PHC analysis was conducted and found elevated concentrations of PCBs within the berm. A sample on the southern side of the berm had a PCB concentration below NRDC SCC.

The former gasoline UST located in this area was removed in 1986 and site assessment sampling was conducted in 1994 (DRAI, Site Assessment, 1995, **Appendix 39**). All sample results were below SCC and the report concluded that no additional action was required.

Based on previously reported data, AOC 9E is impacted with PCBs above NRDC SCC but vertical delineation is demonstrated at 9.5 feet below grade. Delineation to the downslope (south) side is accomplished via samples FF4 and 133. For northern and western sides, the outermost ring of soil borings onsite included A1, C1, C2, CC3 and D2 (1988) and these demonstrate delineation of the northern AOCs (**Figures 2.3.13-1** and **2.3.13-2**).

2.3.14 AOC 10A: Current Drum and Waste Storage Area

As of 1994 when DRAI was conducting RI sampling in this location, it was in use for drum and waste storage. The drums stored in this area were set on a concrete pad with containment walls. The storage area is approximately 40 feet by 70 feet and located entirely within AOC 6, which was formerly the phthalic anhydride process area.

No releases have been reported for this area.

2.3.14.1 Previously Reported Investigations

Three soil samples are located in AOC 6, about 20 feet away from the drum storage pad (V24, U24 and T/U24). In addition, sample 1PAC was located in the eastern side of the pad. **Figure 2.3.13-1** shows these samples and **Table 2.5.6-1** summarizes the analytical data. Data were reported in the 1993 RIR (**Appendix 9**). This information was incorporated into the 2001 RAWP (URS) that was accepted by NJDEP as the basis for the Settlement Agreement (2005).

Based on the SI phase data already reported and submitted, no RI is required for this AOC.

2.3.15 AOC 10B: Former Drum and Waste Storage Area (North of Warehouse 5)

AOC 10B consists of a former drum and waste storage area, which was identified by DRAI on aerial photographs (1994 Draft Revised RIR, **Appendix 10**). The 1966, 1967 and 1969 aerial photographs are cited as the photos used to identify drum storage areas on the northern portion of the site (north of Warehouse No. 5). Inspection of currently available 1963 and 1969 photographs for the area north of Warehouse No. 5 did not identify drum storage in this area. The outline of AOC 10B (**Figure 2.3.13-1**) includes a former dirt road and several areas of reworked earth.

No releases in this AOC are indicated by facility records.

2.3.15.1 Previously Reported Investigations

AOC 10B is bounded by other AOCs to the north and south (**Figure 2.3-1**). For this reason, evaluation of the RI completeness for this AOC focuses on the eastern and western boundaries as

well as the vertical delineation. The original shape of AOC 10B included areas across a tributary to Sling Tail Creek and contiguous to the Naphthalene Area (AOC 14). The boundaries of AOC 10B have been adjusted based on topography to include areas up to the creek, but not crossing the creek. Areas on the opposite side of the creek are now considered to be AOC 14. **Figure 2.3.13-1** shows the adjusted boundary lines.

Initial sampling utilized a grid system. Most samples indicated that contaminant concentrations in soils complied with standards (**Table 2.3.15-1, Table 2.3.15-2** and **Figure 2.3.13-1**). Sample analysis included SVOCs and PCBs with some VOC analysis in early sampling rounds. Later rounds in 2007 were analyzed for PCBs because the broader analyses did not detect additional compounds of concern. The following compounds were reported at concentrations above a soil standard in AOC 10B:

- PCBs
- BEHP (1 location above RDC SCC)

Discrete "hot spots" of PCBs were found, generally on hillsides in AOC 10B. The hot spots were vertically delineated to 3.5 feet below grade.

Sampling results from 1988 to 2007 are reported in the following documents:

- Draft Revised RIR (DRAI, 1994, **Appendix 10**)
- Phase II RIR (DRAI, 1995, **Appendix 11**)
- RAWP (URS, 2001, **Appendix 5**)
- Weston data report of December 17, 2008 (**Appendix 29)**

This information was incorporated into Addendum No. 3 of the Consolidated RAWP (2009), which was approved by NJDEP.

Delineation of this AOC was not complete at Y4.5 (located on a "peninsula" of land between a tributary to Sling Tail Creek and Sling Tail Creek at the southeastern corner of AOC 10B) and FF3 and FF3.5 – both samples on the eastern side of AOC 10B/Sling Tail Creek. Remedial excavation post-excavation sampling data is discussed in Section 6 to complete the RI for this AOC.

2.3.16 AOC 10C: Former Drum and Waste Storage Area (West of Warehouse 4)

AOC 10C is a former drum and waste storage area, which was identified by DRAI on aerial photographs (Draft Revised RIR, 1994). The 1966, 1967 and 1969 aerial photographs are cited as the photos used to identify drum storage areas on the northern portion of the site (north of Warehouse No. 4). Inspection of currently available 1963 and 1969 photographs for the area north of Warehouse No. 4 did not identify drum storage in this area. The outline of AOC 10B (**Figure 2.3.1-1**) includes a former dirt road and several areas of reworked earth. The AOC boundaries are drawn on current maps as shown in 1994 and 1995 DRAI RIR reports, although the basis for the outline is unclear.

No releases in this AOC are indicated by facility records.

2.3.16.1 Previously Reported Investigations

Figure 2.3.13-1 and **Table 2.3.16-1** provide sampling locations and results for AOC 10C.

Initial soil borings were drilled at AOC 10C and located in the drum storage area, adjacent to it and downhill from it. Soil samples were collected to a depth of up to 9.5 feet below grade and analyzed for VOCs, SVOCs and PCBs. This investigation confirmed that COCs are BEHP and PCBs for this area and impact extends to about 10 feet below grade.

1998 Soil Boring (2001 RAWP, **Appendix 5**)

One soil boring was drilled in this area on the downslope side from the drum storage area; soil samples were collected at several depth intervals up to 13 feet bgs for PCB analysis. PCBs were vertically delineated at a depth of 8-8.5 feet bgs.

2007 Delineation

For shallow soils, delineation was not completed within 10C; additional samples collected in AOC 2 complete the delineation.

2.3.17 AOC 11A, B and C: Maintenance Building Tank Areas

The site formerly operated five USTs containing petroleum products, two of which were located in the vicinity of the maintenance building as described below. The other three USTs were located within AOCs 9E, 16 and 18A. One set of two USTs discussed in this section (AOC 11B) contained salts.

2.3.17.1 AOC 11A: Former 1,000-Gallon Fuel Oil UST North of Maintenance Building

AOC 11A was located north of the maintenance building as shown on **Figure 2.3.13-1**. The tank was removed between April and August of 1986 and DRAI conducted site assessment sampling in 1994 (**Appendix 39**, Site Investigation Report, DRAI, 1995). Soil borings were drilled around the former UST location and sampled at the water table, which was encountered at four feet below grade. The highest TPH result for the four samples was 5,790 mg/kg; contingent VO+10 analysis detected no targeted compounds. The TPH standard at the time was 10,000 mg/kg; thus DRAI concluded that no additional action was required.

In evaluating other lines of evidence for this UST, samples E3.75 and E4 were located nearby and included samples up to 6 feet bgs. Analysis for VOC and SVOC **(Table 2.3.17-1**) did not detect analytes above an SCC. PHC analysis was non-detect or well below 1,000 mg/kg in samples at 5.5 to 6 feet bgs. RI is considered complete for AOC 11A.

2.3.17.2 AOC 11B: Salt USTs

AOC 11B consists of two salt USTs that are located east of the Ester I Alcohol Tank Farm. These tanks contain a salt solution used in manufacturing at the Ester I process building and they are plumbed to the Alcohol Tank Farm.

One surface and two subsurface samples were collected analyzed for PCBs or sodium and chloride (**Table 2.3.17-2**). PCBs were below RDC SCC; there are no SCC for sodium and chloride.

The 1992 sampling results were reported to NJDEP in the Remedial Investigation Report, May 1993, DRAI (**Appendix 9**).

This SI phase sampling did not identify soil impact, therefore, no RI is required.

2.3.17.3 AOC 11C: Former Maintenance Building Gasoline UST

Installation date for the UST at AOC 11C is not known, but the tank is associated with a maintenance building first observed on the 1957 aerial photo. A 2,000-gallon gasoline UST was removed from the west side of the building between April and August of 1986 (**Figure 2.3.10-1**). Site assessment sampling was completed in 1994 via soil borings drilled around the former UST location (Site Investigation Report, DRAI, 1995, **Appendix 39**). VOC and lead concentrations in the soil samples were below SCC; thus DRAI recommended no additional action for this area (**Table 2.3.17-3)**.

Site Assessment sampling data was submitted to NJDEP as Appendix A of the Phase II RIR (DRAI, November 1995, **Appendix 11)**. A monitoring well installed later detected BTEX compounds in groundwater. This issue is discussed under Section 2.3.15 (AOC 15: Sitewide Groundwater).

Based on previously submitted data, the RI for soils is complete at this AOC.

2.3.18 AOC 12: Transformers

Transformers are located in nine areas of the facility. The transformers were generally constructed with the area they service; for historical information, refer to the discussion of the large AOC in which the transformer(s) is situated.

The NJDEP inspection report appended to a memo of November 19, 1981 (**Appendix 31)** stated that all transformers on the site were drained in June 1986 and some of the transformer oil was confirmed to contain PCBs. The PCB oil was manifested to S.D. Meyers and transported offsite for disposal.

2.3.18.1 AOC 12A: Electrical Substation

The electrical substation was located near the main site entrance, east of the maintenance building. Transformers were located in a fenced enclosure that was approximately 60 by 105 feet in area (**Figure 2.3.13-1**).

Two surface soil samples were collected within the enclosure and at the most downslope corner in 1988 (**Table 2.3.18-1**). PCBs exceeded SCC and were identified as the COC for this area. This apparent surface release of PCBs is delineated by samples from other AOCs (for example, 131(FF4.5), V23 and 1PAC – **Figure 2.3.13-1**). The RI is complete for AOC 12A.

2.3.18.2 AOC12B: Former Transformer South of Substation

A transformer is located across one of the site's internal roads from the main substation (AOC 12A) and north of the firehouse. AOC 12B is entirely within the bounds of AOC 6, where PCBs are pervasive in soil.

There is no record of a release from this transformer in the Hatco facility documents.

The closest sampling location is approximately 10 to 15 feet west of the transformer. Analysis of a surface soil sample and a deeper sample did not detect PCBs.

Figure 2.3.3-1 shows AOC 12B and the nearby samples. Because no release is documented from this transformer, no RI is required. The closest sample to the transformer does not indicate a PCB impact that would trigger an investigation of the transformer.

2.3.18.3 AOC 12C: Transformer North of Naphthalene Tanks

Transformer UE-7 is located north of the naphthalene tank farm (AOC 9C) and east of the Ester II railroad siding (AOC 3). The Hatco facility records do not document a release from the transformer.

Soil sample 140 (E/GG6.5) was drilled close to AOC 12C in 1988 (**Table 2.3.18-2**). The soil sample from 0-0.5 feet bgs had a PCB concentration above NRDC SCC. The next closest samples are:

- E9(AOC 9C)
- HH9 (AOC 4)
- 128(DD/FF 8.5) (AOC 6)

Surface samples from these locations had PCB content of non-detect to less than RDC SCC.
Figure 2.3.3-1 shows AOC 12C and the samples listed above. This transformer is located in the in areas that will be remediated; based on the planned remediation of the surrounding AOCs, the RI is considered complete for this AOC.

2.3.18.4 AOC 12D: Boiler Building Transformers (Figure 2.3.3-1)

Transformers UE-2, UE-3A and UE-3B are located on the western side of the boiler building (. Because there was no evidence of a release associated with these transformers, no site investigation was required or conducted.

Nearest surface soil samples at HH4.5 and A4.75 were analyzed for PCBs and results were below SCC. No RI is triggered.

2.3.18.5 AOC 12E: Transformer in ZAA Process Area

Transformer UE-6 is located in the center of the ZAA process area (**Figure 2.3.3-1**). There are no facility records of a release associated with this transformer, which would have been installed with the ZAA process in 1984. Because it was installed after the PCB ban and there is no indication of a discharge from it, no sampling/site assessment has been conducted. No RI is required for this AOC.

2.3.18.6 AOC 12F: Two Transformers at AOC 9B (Alcohol Tank Farm)

Transformers UE-4B and UE-5B are located in the southern half of the alcohol tank farm. The transformers were evaluated by soil boring H4.5 (**Figure 2.3.10-1** and **Table 2.3.10-1**).

Soil boring H4.5 was drilled to 13 feet below grade. The 1993 RIR (DRAI) stated that one PCB "hot spot," consisting of Aroclors 1248 and 1254, was found at the surface and one slight exceedance was found at a depth of 8 feet bgs. The RIR further noted that the elevated PCB concentration may be due to the close proximity of this location to AOC 12 (transformers).

On December 22, 1994, DRAI issued a report documenting excavation of the soils at H4.5; this work was done as part of construction projects at the plant. The final excavation was 10 by 13 feet by 1.5 feet deep. Based on this report, included as **Appendix 23**, the shallow PCB impact at H4.5 has been remediated. The DRAI sampling results were incorporated into the 2001 RAWP (URS), which NJDEP accepted as the basis for the 2005 Settlement Agreement.

2.3.18.7 AOC 12G: Transformer at Administrative Building

Tranformer UE-4 was located at the administrative building complex north of AOC 18A (**Figure 2.3.10-1**). Because there were no industrial operations documented in this area, no samples were collected nearby. Because there is no report/evidence of a release associated with this transformer, no SI was required or conducted.

2.3.18.8 AOC 12H: Transformer West of Warehouse No. 4

Transformer UE-5B is located west of the loading dock and south of the drum storage area at Warehouse No. 4 and is within the boundaries of AOC 10C **(Figure 2.3.1-1**). There is no record of a release at this transformer; PCBs were detected in AOC 10C (Former Drum Storage Area) and the RI is considered complete for AOC 10C; thus no additional sampling is required for this transformer.

2.3.18.9 AOC 12I: Transformer South of Naphthalene Tanks

Transformer UE-8 is located south of the naphthalene tank farm (AOC 9C) and north of AOC 5, the Ester II building. The Hatco records do not document a release, nor is there any evidence of a release from the transformer.

This transformer has not specifically been investigated, but soil borings are located around the transformer at distances of about 50 to 75 feet. PCB analysis at these locations confirmed PCBs at non-detect or below RDC SCC.

Figure 2.3.3-1 shows AOC 12I and nearby samples. Because no release is documented from this transformer, no RI is required.

2.3.18.10 AOC 12J: Transformer at Effluent Pretreatment Plant

Transformer UE-5A is located at the Effluent Pretreatment Plant, entirely within AOC 2 (**Figure 2.3.1-1**). There are no records/evidence of releases associated with this transformer. A nearby surface soil sample (C3) had a PCB concentration of 91 mg/kg, but is considered the result of AOC 2 impacts. PCBs are vertically delineated at this area with a 1.5 to 2 foot sample; horizontal delineation is complete for surrounding AOC 2, so no additional sampling is required for the transformer to complete the RI.

2.3.18.11 AOC 12K: Pole Mounted Transformers

Pole mounted transformers are located adjacent to the railway in AOC 3 (**Figure 2.3.3-1**). The transformers are located between AOC 19 and AOC 5B, outside of an area identified as an AOC. There is no record/evidence of a release from these transformers and no sampling was conducted to specifically assess a potential discharge. No RI was/is recommended for AOC 12K.

2.3.19 AOC 13: Southeast Fill Area

2.3.19.1 AOC 13 Description and History

AOC 13 is the Southeast Fill Area, which is located south of the phthalic anhydride residue area (AOC 7A), **Figure 2.3.7-1**. AOC 13 has not been used for any manufacturing operation in the past and no structures were observed on historical aerials for AOC 13.

Prior to Hatco operations, the AOC 13 area is seen to be vegetating after apparently having been cleared, likely for clay mining operations (based on the 1947 aerial and site use history). In the 1969 aerial, numerous small piles of material, typical in shape and size to dump truck loads of soil, are visible at AOC 13. The piles are on the eastern side of the AOC, near Sling Tail Creek. At the same time, the cloverleaf intersection of Route 440 is being constructed to the east and earth working activities are evident on the eastern side of Sling Tail Creek (AOC 20). There is also a faint dirt road access from Riverside Drive (then Industrial Avenue) northward into the site. This access road was not present in earlier photographs. A few small structures (trailers?) are present northwest of the area of soil piles; these are the only evidence of use of this area and they only are visible in the 1969 aerial.

In later photographs (1972 and beyond) AOC 13 appears to have been graded and no further activities are documented in the area.

In the Draft Revised RIR (DRAI, 1994), the report notes that the materials found in AOC 13 "are typically wastes likely from the construction of Industrial Avenue/Riverside Drive (i.e., concrete, wood)."

2.3.19.2 AOC 13 Previously Reported Investigations

Sample locations are shown on **Figure 2.3.7-1** and results indicated on **Table 2.3.22-1**.

Initial Investigations (reported in DRAI, 1994, **Appendix 10**)
Soil borings were drilled across AOC 13 with samples to depths up to 9.5 to 10 feet. Analytical soil sampling protocol varied, but included VOCs, SVOCs, PCBs and metals. The following compounds exceeded an SCC in these soil borings:

- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Indeno(1,2,3-cd)pyrene
- PCBs
- Arsenic

Lead was reported above NRDC SCC at one location but the duplicate sample analysis for that same location indicated a lead concentration below SCCs (%RPD for the duplicate pair is 173%). For this reason, lead is not considered to be a COC for AOC 13.

2007 Delineation Sampling
Based on the NJDEP-approved SAP, dated November 14, 2006, soil borings were drilled around "hot spots" identified by the prior sampling discussed above to complete delineation. These areas were later excavated (to be reported in an RAR).

Table 2.3.22-1 and **Figure 2.3.7-1** detail the sampling and analytical results for this AOC.

The delineation sampling completed horizontal and vertical delineation in most, but not all areas. COCs for AOC 13 are not characteristic of COCs found throughout the Hatco facility (i.e. BEHP and other phthalates, naphthalene and PCBs). Remedial excavations were conducted and are discussed in Section 7 to demonstrate a complete RI for this AOC.

2.3.20 AOC 14: Naphthalene Area

2.3.20.1 AOC Description and History

The naphthalene area is located immediately north of the phthalic anhydride residue area. AOC 14 was formerly used for naphthalene disposal during the operation of the second phthalic anhydride unit. It is estimated that approximately 1,500 to 2,000 cubic yards of material containing naphthalene waste was placed in this area (DRAI, Draft Revised RIR, 1994).

The boundaries originally presented for this AOC have been adjusted to include the entire peninsula of land between branches of tributaries to Sling Tail Creek (**Figure 2.3.13-1**).

2.3.20.2 Previously Reported Investigations

Prior data is summarized on **Figure 2.3.13-1** and **Table 2.3.20-1**.

Investigators noted that the naphthalene residue had a distinctive physical appearance, consistency and odor and was readily identified in the field. It appeared as a brittle, very dark gray to black clay-like material with a strong moth ball-type odor. Readily distinguishable from the native surrounding soil, the material was delineated and excavated based on visual criteria in the field. Results of these subsurface investigations are provided in Appendix F-3 of the draft RI work plan (DRAI, August 1992, **Appendix 40**).

The COCs for this AOC are (1994 Draft Revised RIR, **Appendix 10**):

- Naphthalene
- 2-methyl naphthalene
- PCBs

The crystalline naphthalene and associated impacts are delineated to the north by Z4, to the east by Sling Tail Creek (the elevation of the crystalline naphthalene is above the creek), the Warehouse No. 5 to the west and to the south by AOC 7A.

The horizontal extent of naphthalene impacts is delineated. Scrape areas X012 and X137, discussed in Section 7, confirm vertical delineation.

2.3.21 AOC 15: Site-wide Groundwater

The investigation of groundwater quality at the Hatco site confirmed contaminants above the GWQC and the presence of light non-aqueous phase liquid (LNAPL) at the Site. Groundwater investigations have been performed to address LNAPL and site-wide groundwater contamination.

2.3.21.1 Light Non-Aqueous Phase Liquid

LNAPL was initially reported on May 14, 1992. A discussion of LNAPL investigation, delineation and IRM is in section 5.2.

2.3.21.2 Site-Wide Ground Water

Previous ground water remedial investigations included installation and sampling of monitoring wells, piezometers, and recovery trench wells for site geological and hydrogeological characterization, groundwater contamination assessment and delineation, and/or product recovery. A list of installed monitoring wells, piezometers, and recovery trench wells with well

construction details is provided in **Table 2.3.21-1**. Historical investigations indicated that two aquifer zones exist at the site, including a shallow aquifer within the upper sand layer and a deep aquifer within the lower sand/silty sand unit. The two units are separated by a confining or semi-confining unit consisting of light gray clay. Based on groundwater gauging data collected during the site investigations and/or the local topography, groundwater flows in a south, southwesterly direction, across the Hatco site. **Figure 2.3.20-1** is a groundwater elevation contour map for shallow groundwater and **Figure 2.3.20-2** is a groundwater elevation contour map for deeper groundwater).

Groundwater samples have been collected for chemical analysis throughout the site investigation, which included sampling events from 1992 & 1994, a comprehensive groundwater sampling event in late October and early November 1998, and supplemental delineation sampling in 1998 as part of the Phase III RI. The results of historical ground water sampling have been presented in various reports submitted to NJDEP previously.

Soil and groundwater remediation have been ongoing at the site since the 1990s. Hotspot removals and large-scale excavations in the southeast leg (AOC 2) and northeast impoundment (AOC 7A) areas, as well as product recoveries, have been implemented based on the approved 2005 consolidated RAWP.

Supplemental groundwater sampling events were conducted in September 2010, March/April 2013, September and October 2014, and April 2016 for selected monitoring/recovery wells at the site to further evaluate the groundwater quality following the source removals. The ground water sampling purge sheets are provided in **Appendix 41**.

Groundwater sampling at the site identified the presence of dissolved ground water contaminants above the Class II-A Ground Water Quality Criteria (GWQC) as follows: VOCs, SVOCs, PCBs, and metals. Details are discussed below.

All available analytical results for ground water samples collected from well points and monitoring wells are provided in **Table 2.3.21-2** and **Figure 2.3.20-3**.

2.3.21.3 VOCs in groundwater

BTEX and some chlorinated VOCs (CVOCs) were the main VOCs of concern detected in groundwater samples at the Hatco site.

<u>BTEX</u>

BTEX constituents were reported at concentrations exceeding NJDEP GQWC in the 1992 and 1994 groundwater sampling events, with high concentrations detected in the shallow wells located in the Production Area (MW-15S, MW-19S, 37, and MW-38S) and former Muck area (MW-17S) of the site.

During the 1998 Phase III RI, benzene was detected at concentrations that exceeded the GWQC in 18 of the 39 shallow wells sampled, ranging from 2.3 to 980 ug/L. Elevated benzene was also detected in groundwater samples collected from two (MW-16D and MW-9D) of the nine deep wells at concentrations of 2 and 100 ug/L respectively. Ethylbenzene and xylenes were detected in one shallow monitoring well (MW-54S) in 1998 at concentrations exceeded their GWQC of 700 ug/L and 1,000 ug/L, respectively.

Benzene was detected at concentrations ranging from 110 to 1200 ug/L in groundwater samples collected in September and October 2010 from three recovery wells (IRW-1, IRW-3, and IRW-4) located in the Production Area.

Following hotspot removals and soil excavation conducted in Southeast Leg area (AOC 2), supplemental groundwater samples were collected in 2013 and 2014. The analytical results of the 2013 groundwater samples indicated that elevated benzene was detected in 6 of 17 wells at concentrations ranging from 1.6 ug/L to 177 ug/L with the highest benzene concentration detected in MW-56S. This well was resampled in 2014 and benzene was detected at much lower concentration of 3.3 ug/L and was the only one of 5 wells sampled for VOCs with a benzene exceedance.

Benzene was either non-detect or detected below GWQC in all 4 deep wells sampled (MW-2D, MW-7D, MW-9D, and MW-16D) during the 2013 sampling event.

In comparison to the historical groundwater sample results, the 2013 and 2014 groundwater results have shown significant reduction of benzene in the shallow monitoring wells, and non-detect in deep zone. In addition, the 2010 and 2013 ground water results obtained from wells in the Production Area (IRW3, IRW4, MW-16S, and MW-19S) indicated toluene attenuated below the NJDEP GWQC.

As indicated by **Figure 2.3.20-3**, the extent of BTEX groundwater plume at the Hatco site has been horizontal and vertically delineated. Moreover, as indicated by the recent data, the benzene plume is shrinking (non-detect in MW-7S) in the downgradient direction over the time.

CVOCs

Historically high CVOC concentrations were detected in wells MW-38S, IRW3 and IRW4 located in the Production Area, and MW-17S which was located in the Muck Area (AOC 2).

1,1-Dichloroethane and Chloroethane were detected in the deep wells MW-9D in 1994 at concentrations of 270 ug/L and 190 ug/L, exceeding the GWQC of 50 ug/L and 5 ug/L, respectively.

Chloroethane and Chlorobenzene were the only cVOCs detected in 2 of 13 shallow wells sampled in 2013 exceeded their applicable GWQC. Chloroethane was detected in MW-49S at concentration of 63.2 ug/L, while Chlorobenzene was detected in MW-56S at concentration of 86 ug/L, respectively. The chlorinated VOCs were not detected in any of the four deep wells sampled (MW-2D, MW-7D, MW-9D, and MW-16D) in 2013.

As indicated by **Table 2.3.21-2** and **Figure 2.3.20-3**, the extent of chlorinated CVOCs plume at Hatco has been horizontal and vertically delineated.

2.3.21.4 SVOCs in Groundwater

BEHP, BBP, DNOP, and 2-Hexanone were the primary SVOCs historically (1992 & 1994) detected in groundwater samples predominantly in the Production Area (MW-15S, MW-16S, MW-19S, MW-23S, MW-37S, MW-38S) that exceeded the GWQC. The highest concentrations were detected in MW-15, MW-37S and MW-38S.

In 1998, BEHP and DNOP were the only SVOCs detected at concentrations exceeding the GWQC. BEHP was detected in 13 of 35 shallow wells exceeded or met with the current GWQC, and elevated DNOP was only detected in one shallow wells (MW-19S). The 1998 groundwater results indicated a general decrease of dissolved BEHP in groundwater at the Site since early 90s, and a significant reduction was observed in the monitoring well MW-37S (decreased from12,000 ug/L to ND).

The groundwater sample results from 2010, 2013, and 2014 detected elevated BEHP in shallow wells IRW-1, IRW-4, MW-16S, MW-19S, and MW-42S, with the highest concentration detected in MW-19S (2,140 ug/L). BBP was detected in one shallow well IRW-4 at concentration above GWQC, and DNOP was only detected in MW-19S at concentration exceeding the GWQC. In addition, pentachlorophenol was detected in IRW-1 in 2014 at concentration above the GWQC.

The groundwater sample results obtained from 2010, 2013, and 2014 sampling events indicated the BEHP ground water plume at the Hatco site has been stabilized.

The 1998 groundwater samples from the deep water-bearing zone did not contain any SVOCs at concentrations above the GWQC. In 2013, BEHP was only detected in one deep monitoring well MW-16D at concentration of 5.5 ug/L marginally exceeded the current NJDEP GWQC of 3 ug/L.

As shown in Figure **2.3.20-3**, the extent of groundwater plume containing BEHP, and/or BBP, DNOP has been delineated.

During the 2014 supplemental groundwater sampling event, elevated naphthalene was detected in the newly installed monitoring wells MW4SR, MW-58S and MW-59S at the northeast impoundment (NEI) area at concentration ranging from 700 to 16,000 ug/L, exceeding GWQC of 300 ug/L. The NEI was a disposal area for phthalic anhydride process residuals (AOC 7A) and naphthalene residuals (AOC 14) and was identified as the source of naphthalene in groundwater. Additional remediation of the NEI area began on October 15, 2015 and excavation of contaminated soil was completed in January 2016. Between February 23 and 26, 2016, three new monitoring wells (MW-59SR, MW-60S, and MW-61S) were installed in the former excavation area. Groundwater samples were collected on April 5, 2016 2016 from the three newly installed wells and two existing monitoring wells (MW-4SR and MW-13) located in this area and analyzed for naphthalene. The analytical results of the post-remediation groundwater samples indicate naphthalene was either non-detect or detected at concentrations below the NJDEP GWQC. The new well construction logs, Form As and Form Bs will be provided in the Remedial Action Report. As shown on **Figure 2.3.10-3**, naphthalene is delineated in groundwater.

2.3.21.5 PCBs in Groundwater

PCBs, primary Aroclor-1248 was detected in the 1992 & 1994 groundwater samples at reported concentrations of total PCBs ranging from 2.1 to 24,000 ug/L above the GWQC of 0.5 ug/L. The highest concentrations of PCBs were detected in MW-15S, MW-19S, MW-37S, and MW-38S in the Production Area.

During the 1998 Phase III RI groundwater sampling event, elevated PCB Aroclor 1248 was detected in 12 of the 35 shallow wells sampled at concentrations ranging from 0.56 to 700 ug/L with highest concentration in MW-19S.

Following source removals, the 2013 and 2014 groundwater results detected PCBs in 5 of 15 shallow wells at concentrations ranging from 0.647 to 334.5 ug/L. The highest concentration was detected in the same well MW-19S as 1998, but has shown significant reduction (~50%) compared to 1998 results.

PCBs were detected in groundwater sample MW-9D at a concentration of 4 ug/L in 1998 that exceeded GWQC. However, no PCBs was detected in any of the four deep wells (MW-16D, MW-9D, MW-7D and MW-2D) sampled in 2013 and 2014.

PCB contamination in groundwater at the Hatco site has been delineated and the concentrations of PCBs detected in groundwater have been greatly reduced following source remediation.

2.3.21.6 Metals in Groundwater

Metals analysis was first added to the groundwater samples collected at the Site during the Phase III RI groundwater sampling event. Based on the sampling results, the metals detected above GWQC included some of the heavy metals and the secondary metals Aluminum, Iron, Manganese, and Sodium.

Beryllium was detected in shallow wells in the 1998 sampling event across the Site at concentrations ranging from 1.13 to 7.64 ug/L. The highest concentration was detected in the most upgradient well MW-12S (7.64 ug/L), indicating a background origin.

Chromium was detected in 5 of 33 shallow wells sampled in 1998 at concentrations ranging from 115 to 1430 ug/L at random locations throughout the site, with the highest concentration detected in the most upgradient well MW-3S (1430 ug/L), indicating a background origin.

Arsenic, cadmium, and lead were the primary metal constitutes detected in groundwater samples in 1998 at low concentrations, and as total arsenic, total cadmium and total lead (versus dissolved phases) in groundwater. As discussed in the approved 2005 Consolidated RAWP, the extent of cadmium in groundwater was delineated, and since arsenic was not related to historical operations at the site, and given the low levels concentrations in the shallow groundwater and the absence of elevated arsenic concentrations in the deep groundwater, further delineation is not warranted.

The metal analysis of 2013 groundwater samples indicated detections of arsenic in two wells MW-49S (13.5 ug/L) and MW-56S (9.9 ug/L) of 12 sampled shallow wells at concentrations slightly exceeding the applicable GWQC of 8 ug/L. MW-56S was resampled in 2014, and arsenic was detected below the applicable GWQC at the Site. Cadmium was only detected in one well MW-4S in 2013 at concentration of 4.9 ug/L, marginally above the GWQC of 4 ug/L.

Groundwater samples from the deep water-bearing zone did not contain either arsenic or cadmium.

Lead was detected in 13 shallow samples cross the site and 1 deep groundwater sample (MW-1D) in 1998 at concentrations exceeded the GWQC of 10 ug/L. Elevated lead was only detected in one sample MW-49S of 12 shallow samples in 2013 at concentration of 29.3 ug/L, and only detected in IRW-1 in 2014 at concentrations of 14.78 ug/. Lead was either non-detect or below the GWQC in the most downgradient shallow wells MW-5S, Mw-7S, and MW-55S.

Of four deep wells sampled in 2013, lead was detected in one well MW-2D at concentration slightly above the GWQC. However, lead was not detected in the further downgradient well MW-7D in 2013.

Elevated lead was detected in 1998 groundwater sample MW-51S located further south of the site at the GreDel property. Historical fill has been identified at this property with a Deed Notice filed with the county. A CEA has been established for the historical fill material. Lead detected in this location is likely associated with the historical fill identified in this area.

Cobalt was only detected in MW-2D in 2013 at concentration of 192 ug/L above the GWQC of 100 ug/L. Elevated cobalt was not detected in any other locations or other sampling events. It is clearly not related to the site operations.

Based on the results of groundwater investigations, the extent of groundwater contamination at the Hatco site has been horizontally and vertically delineated, and is limited to the site boundaries, with the exception of a small area of benzene offsite to the west and a small area offsite to the souteast. The historical groundwater data indicate the location and size of the groundwater contamination plume at Hatco site is shrinking.

2.3.22 AOC 16: Research and Development Laboratory

2.3.22.1 AOC Description and History

AOC 16 consists of the research and development laboratory located at the northernmost portion of the property (**Figure 2.3.22-1**). This area never included manufacturing operations (RIR, DRAI, 1994) and is located away from the main plant, with access to the gatehouse via an internal road. The building is not present on a 1957 aerial, but is clearly visible on a 1963 aerial, indicating construction in late 1950s or early 1960s. AOC 16 boundaries are the outline of the R&D complex which includes:

- A laboratory building used for product testing and development, which included storage and use of small quantities of chemicals
- Two parking lots
- One former 2,000 gallon heating oil UST removed in 1986 (DRAI, November 1995)

Weston Existing Conditions maps from 2008 and 2009 indicate that underground water and sewer utility lines extend from the Hatco main plant to the R+D building at AOC 16.

Although not much is known about the specific analytical work done at AOC 16, a detailed list of chemicals that were packed and transported for offsite disposal on February 17, 1989 was found in the site's files (**Appendix 42**). As would be expected for a research laboratory, the inventory indicates storage of a large variety of chemicals in small quantities. Most of these chemicals were in commercially sized containers.

One release incident was reported on at the intersection of King George's Post Road and the site's main access driveway on September 18, 1986 (**Appendix 43**). The incident involved a small volume of heptanoic acid.

Early investigations designated the R+D operational area as an AOC "in order to determine whether contamination is present based upon its use for research purposes" (RIR, DRAI, 1994). Because chemicals were used in the laboratory and no previous sampling was been performed in this area, a 50- by 50-foot grid (which was smaller than the 200- by 200-foot grid employed elsewhere) was utilized for initial sampling.

Soil samples were collected from ground surface to depths of up to 10 feet bgs. BEHP and other plasticizers were detected at trace concentrations, well below the most stringent SCC except as noted below (**Table 2.3.22-1**provides a data summary).

Two COCs were identified:

- Benzo(a)pyrene concentration above NRDC SCC at one location at a depth of 1.5 to 2 feet
- PCB concentrations exceeded RDC SCC at FF35 (0-0.5 feet).

1994 Former Underground Storage Tank Assessment

In November 1995 DRAI issued a Phase II RIR which included a report of site assessment soil borings drilled in the location of five former USTs at Hatco. The former 2,000-gallon heating oil tank formerly located on the north side of the R+D building is shown on **Figure 2.3.22-1**. **Appendix 11** includes a copy of the report, which was submitted to NJDEP with the Phase II RIR. Soil samples were analyzed for TPH (**Table 2.3.22-1**) with a contingency for additional analyses if the TPH result exceeded 1,000 mg/kg. No contingency analyses were required because the highest soil result was 201 mg/kg.

Soils with PCB concentrations above RDC SCC are delineated by the following locations: E35, SB220, DD35, E34, FF34 and DD34. The RI is complete for this AOC.

2.3.23 AOC 17: Clean Fill Area

2.3.23.1 AOC Description and History

The "clean fill area" (as referenced by DRAI) is a region of disturbed ground that can be seen in aerials dating from 1931 (earliest available) to 1987 (**Figure 2.3.23-1** shows AOC 17). From 1947 to 1984 topographic quadrangle maps mark the area as mining. No activities inconsistent with borrow pit and refilling are noted in a review of historical aerials from 1931 to 2013.

Facility records did not document releases in AOC 17.

This area was sampled and analyzed for the PP+40 list to assess the quality of the fill material placed in this area (**Table 2.5.24-1**). Analytical results for samples from this AOC complied with SCC.

DRAI ranked this AOC as "of low environmental concern" following the sampling event (1993 RIR, **Appendix 9**). Based on soil borings, the fill/native soil boundary is interpreted to occur at a depth of 12.5 feet, where an organic layer is reported in the log.

No RI is recommended for this AOC; no evidence of a release was found by SI phase sampling.

2.3.24 AOC 18A: Pilot Plant I

2.3.24.1 AOC Description and History

AOC 18A is located at the northern edge of the main plant and it is a research and development area that includes the features below, which were assessed via the sample listed next to the feature:

- Offices (which utilized a 1,000-gallon heating oil UST) – 1994 DRAI Site Assessment
- Laboratories – Soil Borings F3.5, F3.75 and G3.75
- Pilot plant – Soil Boring H3.25
- Drum and Flammable Storage Area – H3.75, B3.75
- Shed; and
- Loading Rack – B3.75, H3.75, G3.75, F3.75 (**Figure 2.3.10-1**).

Hatco used these buildings for small-scale manufacturing to test new processes or equipment. They were identified as AOCs because chemicals are employed and produced when the tests are conducted (1994 Draft Revised RIR, **Appendix 10**).

Three releases were documented in Hatco's files for the AOC 18A area (**Appendix 2.3.24-1**). With the exception of a diesel oil spill, the incidents recorded above were known chemicals, limited in duration, small volume and cleaned up immediately.

2.3.24.2 Previously Reported Investigations

Table 2.3.24-1 and **Figure 2.3.10-1** summarize investigative sampling at AOC 18A.

The following were identified above SCC for this AOC (RIR, 1993, **Appendix 44**):

- Benzo(a)pyrene – 1 sample (2-2.5 feet bgs)
- PCBs (yard between Pilot Plant I and the Shed)

PCBs are vertically delineated at 9.5 feet bgs. Soil logs indicated brick fragments so it is concluded that the impacted material is fill.

DRAI concluded that AEC 18A is of low environmental concern.

1986 UST Removal and 1994 Site Assessment

A 1,000-gallon UST used for No. 2 Heating Oil was removed from the west side of the office building at AOC 18A between April and August of 1986. A Site Investigation was conducted by DRAI in 1994 (**Appendix 39** Site Investigation Report – UST Closures, DRAI, 1995). DRAI drilled soil borings UST4-1 to UST4-4 around the 4 sides of the former UST excavation and collected soil samples for TPH analysis (deepest sample was at 6.5-7 feet bgs). The highest TPH concentration was below 1,000 mg/kg.

Additional soil sampling data from 2006 was reported in 2007. This information was incorporated into Addendum No. 3 to the Consolidated RAWP (2009), which was accepted by NJDEP. PCB impact is delineated by surrounding samples from AOC 18B, AOC 9B and a sample from the access road that is not within the bounds of an AOC – sample 132/HHA3.75. This sample is included in **Table 2.3.24-1** and completes the delineation for PCBs to the east. Remedial excavations complete the remaining delineation (Section 7).

2.3.25 AOC 18B: Pilot Plant 2

2.3.25.1 AOC Description and History

AOC 18B is located at the western edge of the main plant and it is a research and development area that includes the following potential concerns with the samples near those concerns indicated:

- Pilot Plant 2 – I3.0, II3.25
- Building No. 8 – K3.5
- Compactor (**Figure 2.3.10-1**) – II3.25

Hatco used Pilot Plant 2 for small-scale manufacturing to test new processes or equipment. This area was identified as an AOC because chemicals are employed and produced when the tests are conducted (1993 RIR, DRAI **Appendix 9**).

No releases are documented in Hatco files for this AOC.

2.3.25.2 Previously Reported Investigations

Soil samples were collected from the surface and subsurface. A total of 15 samples were collected from seven soil borings at AOC 18B. The depth to ground water in the area is approximately 10 to 12 feet below grade.

Samples were analyzed for VOCs, BNs, AEs, PCBs, and metals. Soil analytical results are on **Table 2.3.25-1** and sample locations are on **Figure 2.3.10-1**.

One "hot spot" of PCBs (I3.0) and two "hot spots" of BEHP (I3.0 and K3.75) were detected at AOC 18B at the surface above NRDC SCC. The PCB detection above RDC SCC is vertically delineated at 3.5 feet bgs.

Impacted materials appear to be fill; peats and plant matter were encountered in soil borings at depths of 5.5 to 7 feet bgs.

DRAI concluded that AEC 18B is of low environmental concern. These sampling results were transmitted to NJDEP in the RIR (May 1993, DRAI, **Appendix 9**).

Additional soil sampling data was reported in 2007, but soil borings around the formerly identified hotspots did not complete the delineation. However, the hotspots were excavated and the RI is complete, as discussed in Section 7.

2.3.26 AOC 19: ZAA Process Area

2.3.26.1 AOC Description and History

According to the NJDEP inspection report of September 6, 1988, the ZAA process uses aspartic acid and benzyl alcohol in a phosgenation process to produce an intermediate chemical used in production of Nutrisweet (aspartame) artificial sweetener. The intermediate is sent offsite for final production. DRAI (Draft Revised RIR, 1994) noted that the ZAA process began circa 1983 and was shut down in 1994. DRAI further noted that 1,1,1-TCA was used as a solvent to extract impurities in the product until 1991, when carbon filtration was used instead. An internal memo of September 4, 1991, included as **Appendix 45**, describes the use of 1,1,1-TCA in the ZAA process.

Two items in Hatco's records of releases were noted with regard to the ZAA process **(Appendix 46**).

2.3.26.2 Previously Reported Investigations

AOC 19 is entirely internal to the site and is delineated by AOCs surrounding it **(Figure 2.3-1**).

Sample locations and data for AOC 19 are summarized on **Figure 2.3.3-**1 and **Table 2.3.26-1.** COCs identified by soil sampling at AOC 19 included:

- Benzo(a)anthracene
- Benzo(a)pyrene
- BEHP
- Naphthalene
- BBP
- DEP
- DNOP
- PCBs

One soil sample at 8 feet depth indicated 1,1,1-TCA and 1,1-DCA concentrations above IGW, but this location is interpreted to be within the water table (DRAI estimated depth to groundwater at 8 feet bgs at AOC 19).(**Appendix 11)**.

- 1996 –On April 22, 1996 NJDEP recommended that the source of the 1,1,1-TCA and 1,1-DCA in subsurface soils within this AOC be further investigated. As noted in the RIR,

delineation of the eastern extent of contamination detected in this AOC has not been accomplished due to the presence of physical obstructions.

- 2007 – Six soil borings were drilled by Weston as proposed in an NJDEP-approved 2006 SAP. Results from the 2007 sampling were transmitted to NJDEP on December 17, 2008 (**Appendix 29**). This data was incorporated into Addendum No. 3 to the Consolidated RAWP (2009), which was approved by NJDEP.

Surface soil sample A13 provides delineation to the east for SVOCs and PCBs found in surface samples at AOC 19. To the west, sampling at AOC 2 and AOC 23 provide delineation. To the south AOC 5B borders AOC 19.

Soil boring SB281 (discussed under AOC 4) provides vertical delineation for PCBs on the northern side of AOC 19 at 16.5 feet bgs. Other soil borings within AOC 19 indicate vertical delineation at 6 to 9 feet bgs. It is concluded that the RIR is complete for soils at AOC 19. Groundwater is addressed as AOC 15.

2.3.27 AOC 20: Area East of Sling Tail Creek

2.3.27.1 Description and History of AOC 20

The area east of Sling Tail Creek is an open area that was formerly used for clay borrow pits. AOC 20 encompasses approximately 10 acres of undeveloped, vegetated land defined by Sling Tail Creek's bank to the west and the parcel boundary line to the east. **Figure 2.3.27-1** depicts the AOC and past sample locations. The dimensions of this AOC varied historically; the current definition is based on measureable features and includes the entire open area.

Historical aerial and map review identified no industrial operations and no structures in this area. Various small, dirt roads are observed that do not persist from one aerial to the next (not indicative of habitual use). In the 1969 aerial the cloverleaf intersection for Route 440 is under construction and it appears that fill material has been extended from the roadway onto site, and up to Sling Tail Creek in areas.

2.3.27.2 Previous Investigations

No historical sampling occurred in this area until DRAI established a grid across the site and collected samples at various grid nodes. DRAI's Draft Revised RIR (August 1994, **Appendix 10**) described the sampling effort: "Since there has been no history of chemical activity, storage or use in the area east of Sling Tail Creek, the sampling was restricted to the surface interval (0.0 to 0.5 and 1.5 to 2.0 feet below grade) at a grid spacing of 200 by 200-feet."

Analyses included BNs, PCBs and metals in various samples. Two hotspots were identified: one for naphthalene and one for lead (**Table 2.3.27-1**).

The area represented by the sample with the elevated naphthalene concentration was excavated, but the lead area was overlooked in subsequent investigations. Section 7 presents the post-

excavation soil sample results for naphthalene and the delineation sampling conducted for the lead sample to complete the RI.

2.3.28 AOC 21A: Channel A

2.3.28.1 Description and History of AOC 21A

Channel A is a surface water ditch that runs north to south along Hatco's western property line for approximately 450 feet (blue line shown on **Figure 2.3.1-1**). At the southern end, the channel bends westward, moving offsite to join with Channels B and C before entering a culvert on the northern side of Riverside Drive.

Channel A, identified by DRAI as AOC 21A, is initially observed on the 1969 aerial photograph, which is the first view of Hatco after the construction of two wastewater lagoons (AOC 1) circa 1967. Channel A appears to be a re-routing of an older channel (first observed in 1963 and discussed as part of AOC 25's history) around the lagoons after their construction. Channel A was apparently constructed with the Lagoons, which was after connection with the MUA.

The 1994 Draft Revised RIR (DRAI, **Appendix 10**) identified AOC 21A is "the Crow's Mill Tributary." The report further noted that the creek had previously not been identified as an AOC, however because of the past site drainage history, DRAI conducted sediment sampling in March 1988. Based on results of the sediment investigation, Channel A was then considered an AOC.

In 1998 Woodward-Clyde issued a Surface Water Modeling Study on behalf of W.R. Grace (**Appendix 47**) that included Channel A in its scope. The nomenclature used in that report for naming the channels is used in this report and Weston field inspection information was used to plot the blue line channel location on **Figure 2.3.1-1**. AOC 21A is still present as of the production of this RIR, but the channel has been completely excavated and replaced.

Hatco files contained information on one incident involving caustic wastewater at AOC 21A **(Appendix 48**).

2.3.28.2 Previous Investigations at AOC 21A

Sediment Samples

Early sampling events in 1988, 1992 and 1994 were presented and discussed in the 1994 Draft Revised RIR (DRAI, **Appendix 10**). A summary of all sediment data available for AOC 21A is provided in **Table 2.3.28-1**.

Analysis of initial sediment samples included PCB, SVOCs and VOCs.

The 1995 Phase II RIR (DRAI, **Appendix 11**) included calculation of sediment quality standards for SVOCs. TOC-adjusted fresh water sediment-specific criterion values and biological effects screening levels are provided below for the compounds of concern:

Parameter	SQC Lower	SQC Upper	Adjusted Lower	Adjusted Upper
B(a)A	230	1600	4.6	32
PCBs	19.5	99.9	0.39	2.00

Parameter	Effects Range Low	Effects Range Median
Acenaphthene	0.15	0.65
Anthracene	0.085	0.96
B(a)P	0.4	2.5
Chrysene	0.4	2.8
Flouranthene	0.6	3.6
2-methyl naphthalene	0.065	0.67
Naphthalene	0.34	2.1
Phenanthene	0.225	1.38
Pyrene	0.350	2.2
Dibenzo-a,h-anthracene	0.06	0.26

BEHP was also reported at concentrations above LELs.

On April 22, 1996, NJDEP provided comments on the Phase II RIR via letter. The comments required a BEE for Crows Mill Creek, but did not specifically comment on AOC 21A.

In 1998, the Surface Water Modeling Study (**Appendix 47**) identified areas of sediment accretion and these areas were targeted for sampling.

The 1998 sampling event included a sediment sample from 1 to 2 feet depth; this sample achieved delineation of BEHP (at 22 mg/kg, but not at 0.75 mg/kg, which is the LEL) and PCBs (to less than 1 mg/kg). Reported concentration of several SVOCs were above the LEL.

As discussed under AOC 25, delineation of COCs south of Riverside Drive was accomplished by sediment sampling in Channel D (AOC 25).

Additional sediment samples were collected and analyzed for PCBs as part of delineation sampling for a sitewide capping remedy (reported in 2008 – **Appendix 29**).

Impacted sediment is limited to the channel itself; offsite sediment delineation was discussed under AOCs 23, 24 and 25. Remedial excavation at Channel A resulted in removal of all sediment in this AOC; the remedial action will be presented in a separate RAR.

Soil Samples

The reports referenced above also included soil sample analysis outside of the channel. PCB, VOC and SVOC analysis identified PCBs as the only COC in soils. Impact depth was up to 3.5 to 4 feet bgs; at that depth PCB concentration was between RDC and NRDC SCC.

A deeper soil boring drilled in 1998 completed vertical delineation at 11 feet bgs.

Soil sample M18 (**Figure 2.3.1-1** and **Table 2.3.28-2**) completes the horizontal delineation of surface soil in the northeastern corner of AOC 21A.

In 2014, additional soil samples were collected around the culvert where Channels A, B and C combine; these samples detected benzo(a)pyrene, benzo(b)fluoranthene above SCC; as discussed elsewhere, these are not considered to be Hatco COCs and are found near Riverside Drive in several AOCs. No further obligation beyond providing data to the property owner remains for Hatco since these sampling locations are offsite. Soil samples collected from 2 to 2.5 feet bgs provide vertical delineation of BEHP and PCBs in soils.

Soil boring SB434, located in the median of Riverside Drive, provides horizontal delineation for PCBs for AOC 21A. Based upon the above data and the remedial action data discussed in section 7, the RI is considered complete for soils and sediment at AOC 21A.

Surface Water

Surface water delineation was completed in 1999 as discussed under AOC 25. **Table 2.3.28-3** summarizes surface water sampling data for Channel A, including 2014 samples collected for other purposes (not for delineation). These are also discussed with AOC 25. RI for surface water was considered complete with the 1999 data.

2.3.29 AOC 21B Sling tail Creek

Sling Tail Creek is a perennial surface water stream that flows east of the main plant and bisects an open area not used for industrial processes. Approximately 1700 feet of creek flows through the site and the channel is roughly 8 to 10 feet deep with respect to the western stream bank (i.e. the higher side of the creek).

A 1904 Clay Quarry Map shows that the creek once turned westward at the southern site boundary and emptied into Crows Mill Creek. The creek was rerouted at an unspecified time to flow southward beneath Industrial Avenue.

In the 1960s the US Army Corps of Engineers and NJDEP visited the site on several occasions. In 1967, site inspection reports reference 40,000 to 200,000 GPD flows from the Phthalic Anhydride Plant area to Sling Tail Creek (Affidavit of Christian T. Hoffman, Jr, October 3, 1967). Historical documents do not specify the location of the discharge, but do clearly associated it with the Phthalic Anhydride process and the location of that process is well documented.

Historical aerial photographs show the location of surface drainage from the Dry Storage Warehouse area to the creek (example: 1970 Aerial, NJ GeoWeb GIS layer). Historical site information indicates consistent use of that building as a dry storage warehouse and thus no industrial discharge is indicated to this drainage feature.

Surface water grab samples collected by regulatory inspectors at an unspecified location within Sling Tail Creek in 1967 found acidic effluent (pH of 3.4 to 6.9 standard units) with a Chemical

Oxygen Demand of 200+. Sediment sampling at an unspecified location in Sling Tail Creek by NJDEP identified elevated concentrations of BNs. BNs with concentrations above ESCs included naphthalene, acenaphthene, fluorene, fluoranthene and pyrene.

DRAI conducted an SI of Sling Tail Creek by collecting sediment samples from 10 locations along the creek (approximately every 200 feet) including offsite up gradient and offsite down gradient locations. Samples were collected from the surface (0-0.5 feet) and deeper (1.0-1.5 feet) intervals. Analysis included PCBs (all samples), BNs (approximately half of the samples) and VOCs (1 sample). PCB analysis indicated the highest concentration was 11 mg/kg (**Figure 2.3.29-1, Appendix 8,** DRAI Final Remedial Investigation Work Plan of February 15, 1993**)**. This concentration was horizontally delineated but not vertically delineated.

Later in 1988, approximately 18,000 cubic yards of impacted soil was excavated from the upland area immediately adjacent to the creek. The excavation addressed an historical practice of depositing solid residuals from the Phthalic Anhydride process on the surface at AOC 7A.

In 1992 a remedial investigation of Sling Tail Creek sediment involved re-sampling former PCB hotspots and collecting 2 downstream samples offsite on the opposite side of Riverside Dive (**Figure 2.3.29-1)**. Samples were collected at depths up to 4 feet below stream bed. Results indicated PCBs and BNs below LELs or below the site-specific standard of 1 mg/kg of PCBs and 22 mg/kg of BEHP (**Table 2.3.29-1).**

In response to NJDEP comments regarding Sling Tail Creek RI work, two additional downstream locations were sampled in 1994. These locations were offsite, on the opposite side of Riverside Drive. Both samples were at the stream bed (0.0- to 0.5- foot Depth interval) and included PCB and BN analysis. The sample closest to site had 2-methyl naphthalene and DNBP above ESCs. The distal sample results were below ESCs (**Table 2.3.29-1 Appendix 11,** Phase II RIR**,** Volume I, DRAI, November 1995**)**. Onsite Sling Tail Creek sediment sampling did not detect 2-methyl naphthalene. Because it was present in one offsite sample in the median of Riverside Drive but not in onsite samples it was not considered to have originated from site operations.

Review of the historical sampling results for Sling Tail Creek sediment concludes that vertical delineation for PCBs is needed in one location. An inspection of the culvert between lanes of Riverside Drive concluded that no sediment remains in this area and vertical delineation for DNBP is not possible/required. Additional RI phase sampling was conducted to complete the delineation; it is reported in Section 7.

2.3.30 AOC 22: Sewer System

2.3.30.1 Description of AOC 22

The Hatco sewer system is constructed around three trunk line sewer sections that radiate outward from the EPT to the (1) Ester I plant, (2) ZAA and former PA plants, and (3) Ester II plant. The system is a combined sewer which carries both process wastewater and storm water to the EPT plant (AOC 2) where the removal of floatable organics and pH adjustment occur. From

the EPT, flow is conveyed by a single pipe to a discharge connection with the MCUA interceptor at the south end of the property. The general layout of the sewer system is shown on Figure 7.0-1 of the 1994 Draft Revised RIR (DRAI, **Appendix 10**).

Sewer Investigation

For each of the subsurface sewer trunklines the following data were developed and evaluated by DRAI:

(1) Age of sewer pipe.
(2) Pipe material and compatibility with chemical constituents in stream.
(3) Leakage and break history.
(4) Depth and proximity to ground water.
(5) Testing and inspection reports.
(6) Soil sampling results.

DRAI reached the following conclusions with regard to the plant's sewer systems:

Line 1: Ester I Sewer Line

The Ester I line, is constructed of fiberglass reinforced plastic (FRP) pipe, was installed on above ground racks in 1991. The Ester I line operates under pressurized flow. Being of recent and above ground construction, this line was not evaluated further.

Line 2: ZAA Former PA Plant Sewer Line

The ZAA line, installed in 1966, is constructed of fiber resin pipe (FRP) and operates under gravity flow principles. The FRP material used in the ZAA line is considered to have excellent resistance to the aggressive chemicals discharged within the plant. No limit to service life is reported in the literature. Line breaks have been found in two areas; both related to contractor accidents. Both breaks have been repaired. Camera survey, documented in a March 1991 report prepared by Killam Engineering Associates (**Appendix 49**), reported no significant cracks, deterioration or leakage.

Line 3: The Ester II line is primarily constructed of steel pipe and operates under gravity flow principles. No breaks or leaks have been recorded for this sewer line. In March 1992 (Killam 1992), major sections of the Ester II line were inspected by remote camera. No significant observations of deterioration, leakage or breakage were reported for the pipe.

Line 4: MCUA Discharge Line was constructed of FRP sewer pipe in two segments beginning in 1966. The MCUA discharge line operates under gravity flow principles. DRAI concluded that under normal operation, ex-filtration from the line will not occur.

In summary, none of the four sewer trunk lines investigated exhibits conditions of physical deterioration that would indicate leakage or potential source areas for leakage. RI is considered complete for AOC 22.

2.3.31 AOC 23: Channels B and C

AOC 23 consists of two surface water channels that are offsite with respect to Hatco (**Figure 2.3.31-1)**. AOC 23 lies on the eastern side of two offsite parcels: Block 71 Lot 6 (owned by CP Properties, Inc.) and Block 71 Lot 7 (owned by Woodbridge Township). The channels are designated "Channel B" and "Channel C" based on the Surface Water Modeling Study, Woodward-Clyde, 1998, **Appendix 47**. Both channels are on Block 71 Lot 7 and Channel B extends northward onto Block 71 Lot 6.

Channel B parallels Hatco's western property line and runs roughly north-south until it empties into a channel segment that emerges from the southeastern corner of Woodbridge Pond, collects surface water from Channel B and Channel A (AOC 21A), and empties into a culvert at Riverside Drive. Channel B is approximately 1,000 feet long and its watershed (Figure 2-3 of the 1998 Modeling Study) encompasses the northern and western sides of Hatco, including some tank storage/processing areas and an area that included former settling ponds and a muck storage area. Channel B was inspected in April of 1998. Field inspections indicated the following:

- Near Channel B's headwaters (most upstream segment that was inspected) the channel width was 4.5 feet and the mid channel water depth was about an inch. This location was noted to be "upstream of major leachate area." An area where the channel depth changes abruptly was noted about 30 feet upstream of transect TRB-06 and the substrate above this area was clay. Below this area the substrate was an erosional area followed by sedimentation.

- Section TRB-05 was noted to be "upstream of a major leachate area" and the channel widened to 8 feet with a water depth of about 5.5 inches. Heavy flocculation (presumably iron) was noted just upstream of the section and upstream of the referenced leaching area. Algal and fungal mats were present.

- Section TRB-04 was near a seep and had a flow of about 0.1 feet per second. Channel width was about 8.5 feet and water depth about 3 inches. Field notes indicated a sheen and iron flocculation on the substrate. Vegetation at this point was phragmites.

- At TRB-03 a wide flat phragmites lowland was present and the channel was about 14 feet wide. A steady flow was noted (no velocity approximated), as was a "heavy sheen" and iron flocculation.

- No sheen was noted at TRB-02, which was also a phragmites lowland. Channel width was about 10 feet and water depth about 2 inches. The photo of this location shows a scum on the water surface (no sheen).

- At TRB-01 a sheen was again noted and the vegetation was now skunk cabbage. The channel was about 12 feet wide with a water depth of 2.5 inches.

- Section TRB-00 was located near the culvert under Riverside Drive. At this location sand and boulders were present, indicating a high energy environment. Channel width was

little more than 4 feet and water depth was 7 inches. No sheen was noted. A photo of this location shows a bright metallic, patchy and localized "sheen" on the water surface that appears to be iron bacteria (the field investigator also did not interpret it as a sheen – a similar bacterial condition was observed offsite in Channel D).

Channel C is approximately 280 feet long and located entirely on Block 71 Lot 7. Channel C empties into to Woodbridge Pond. Woodward-Clyde (1998) concluded that Channel C was an erosional area and deposition would have occurred in Woodbridge Pond (AOC 24) so no detailed analysis, including channel measurements or inspections, were conducted at Channel C. The short segment of channel leaving the southeastern corner of Woodbridge Pond and connecting with Channels B and A is also called "Channel C." Section 2.5.34 below discusses the sampling and delineation completed in Woodbridge Pond.

2.3.31.1 Channel B and C History

Channels on the east side of Hatco are first identifiable on the 1969 aerial photograph, but also may have been present in 1963 (possible drainage ways are faintly visible). On May 22, 1968, Tenneco wrote a letter to W.R. Grace regarding apparent Hatco discharges to a stream that fed "Brinkman's Pond" (note: Brinkman's is referenced as Woodbridge Pond in this RIR):

Since I had not heard from your company following our telephone conversation on Monday, I thought it in order to give you a brief summary of the facts with respect to the water pollution problem at the Fords, New Jersey plants of your Hatco Division and our Heyden Division. We are subject to an order obtained by the New Jersey Department of Health with respect to possible pollution of our West Pond which in turn is a tributary source to the Raritan River. Our West Pond is fed through the so-called Middle Pond by Brinkman's Pond. The latter is fed by a stream on our property which prior to feeding by the Hatco stream described below is very clear water with an average BOD(Biological Oxygen Demand) of six parts per million.

Following certain earth moving operations by your Hatco plant last year a stream has been diverted so that it flows into the feeder stream above mentioned on our property. This stream by physical observation contains effluent from some portion of your operations and has been tested for BOD. Tests carried out in March and April 1968 indicated a minimum BOD for this effluent stream of 243 and a maximum of 2,250. This range is far in excess of any acceptable limit under the regulations of the New Jersey Department of Health or for that matter any other regulatory body.

The text above indicates that a stream on the Tenneco (now Woodbridge Township) property began to receive Hatco runoff in 1967 after a construction event on the Hatco property. Historical aerial photograph analysis (Section 2.5.34 below) confirmed that Hatco's original industrial discharge channel bisected the footprint of two lagoons (AOC 1) constructed in 1967 and was not located in the vicinity of AOC 23. The industrial discharge was connected to the lagoons and the MUA while the original channel was re-routed to the west of the lagoons (i.e. into the location of Channel A, which is on the Hatco site) when the lagoons were built. At this

time, the industrial discharge was piped to the new lagoons and the MUA. The sewer construction activity would have changed topography on the western side of the lagoons in the vicinity of Channels A, B and C.

An August 5, 1968 internal memo from W. R. Grace states "There is no doubt that surface water running through the southwest swamp ultimately finds its way into the Heyden Pond,* however; all of Hatco effluent including the Production Office and Engineering Office sanitary sewer has been diverted to Middlesex County Sewer Authority." This W.R. Grace statement implies that the sanitary sewer from the two offices may have been the source of the relatively elevated BOD measured in the offsite channel as referenced by Tenneco.

A W.R. Grace letter of August 21, 1968 to the State Department of Health indicated that on August 2, 1968 Hatco "filled in a large section of the swamp adjacent to our (Hatco's) property and along the public service High Tension right-of-way. We also discovered a fresh water spring on our (Hatco's) property that we piped directly to the Middlesex County Sewerage Authority. There is, at present, no dry weather flow to Heyden's Pond." The letter further states "Heyden (note: Tenneco's Heyden facility) and Hatco agree that the problem is solved and we trust you concur."

**Note: "the Heyden Pond" is Hatco's reference for Woodbridge Pond, which was owned by Tenneco and part of their Heyden facility at the time; whereas Tenneco references the same water body as "Brinkman's Pond."*

As noted by Woodward-Clyde, a seep apparently was also present in Channel B in 1998.

One spill is documented that appears to have impacted the area defined as AOC 23 (**Appendix 50).**

2.3.31.2 Sediment Sampling

Discussion of offsite sediment data references a risk-based PCB standard of 1 mg/kg (Section 5.3). NJDEP ESCs are used for comparison to SVOCs except for BEHP, which also has a site-specific sediment value of 22 mg/kg (Section 5.3). **Table 2.3.31-1** provides BEHP and PCB analytical results for sediment samples, **Table 2.3.31-2** summarizes extended analyses when those were conducted and **Table 2.3.31-3** calculates %RPD for field duplicate samples when they were collected as part of the various sampling programs.

<u>Channel Sediment Sampling 1988 to 1992 (DRAI)</u>

Sediment samples were collected from Channel B beginning in 1988 and continuing into 1992 by DRAI. Sediment sample depths ranged from 0.0-0.5 feet to 3.5 to 4.0 feet below the sediment interface (samples were designated "CM"). Analytical protocol included PCBs for all samples, SVOCs for some samples, and VOCs for only one sample (CM9, at the 3.5 to 4.0 foot depth interval). Sediment sample CM9 was collected from the upstream area of Channel B at 0.0 to 0.5 feet, 1.5 to 2 feet, and 3.5 to 4 feet below surface. **Table 2.3.31-1** summarizes the sediment sample results. Aroclor 1248 was detected in all samples but exceeded 1 mg/kg at CM7 (0.5-1.0

feet) only. Aroclor 1254 was detected at CM9 at trace concentrations. No VOCs were detected and BEHP was the only SVOC detected. BEHP content was well below 22 mg/kg.

Results for a field duplicate sample pair collected at CM13 (0.0-0.5 feet, collected in 1994) indicated good precision for SVOC and PCB analyses (**Table 2.3.31-3**).

Sampling results were presented in the Remedial Investigation Report (DRAI, 1994 – **Appendix 10**) and later summarized in the URS Remedial Action Work Plan (RAWP, 2001).

1998/1999 Sampling Events

The Woodward-Clyde hydrologic modeling study (1998, **Appendix 47**) predicted sediment accretion areas which were targeted for sampling in a 1998 sampling event. SED-1, SED-2 and SED-3 were collected on December 18, 1998 from areas upstream of the leachate area identified by Woodward-Clyde (1998). SED-6 was collected downstream of that area – all in Channel B.

Tables 2.3.31-1 and **2.3.31-2** provide results and **Figure 2.3.31-1** shows the sample locations. Aroclor 1248 is the only PCB detected and SED-6 is the only location where the concentration exceeds 1 mg/kg. No BTEX is detected and the only SVOCs detected were BEHP, DNOP, BBP and DNBP – all at concentrations below ESCs.

A second sample (SED-6 from 1 to 2 feet depth) was collected in 1998 from the same location as SED-6 (0.0 – 0.5 feet depth) and analyzed for SVOCs, PCBs, metals, TPH, TOC and BTEX. Concentrations of all but BEHP, DNOP, BBP and PCBs decreased. Additional SVOCs fluoranthene, phenanthrene and pyrene were detected at trace concentration. Arsenic and copper concentrations exceeded ESCs in sediment samples but did not correlate with BEHP concentration.

2007 Sampling Event

On January 25, 2006 NJDEP provided comments that indicated additional sampling in offsite channel areas would be required. On June 8, 2007 the Revised Channels A, B, C and Pond Sampling and Analysis Plan was prepared. The 2007 SAP noted that PCBs had been reported in soil or sediment at concentrations from less than 0.49 mg/kg (the RDC SCC) to 500 mg/kg "in adjacent wetlands soil." The SAP was designed to assess if PCBs and BEHP from Hatco migrated into offsite areas, including Channels B and C (as well as Woodbridge Pond, discussed in Section 2.5.33 below). The SAP followed the Technical Rules (NJAC 7:26E) in effect in 2007 and the 2005 Field Sampling Procedures Manual.

On December 17, 2008 Weston submitted a 2007 Data Progress Report to NJDEP and included the results of the 2007 sampling (**Appendix 29**). This Progress Report concluded that "the limits of off-site soil and sediment contamination have been defined by Weston's verification sampling program." A standard of 1 mg/kg for PCBs was applied to sediment data. The sampling program identified 22 locations where offsite soil and/or sediment exceeded unrestricted use standards. The results of the sampling were incorporated into the Addendum No. 3 to the Consolidated RAWP (2009), which was approved by NJDEP.

Table 2.3.31-3 shows the duplicate pair for sample CB_NORTH; calculated RPD for the total PCB analysis was 1.6%, indicating good precision. However, the identity of the specific Aroclor (1248 vs 1254) did not agree.

Sediment samples collected during this effort are summarized on **Table 2.3.31-1** and are designated "CA" (Channel A), "CB" (Channel B), "CC (Channel C). The results of this sampling event indicated remediation for PCBs in channel sediments would be required. Remediation has been completed, as described in the remedial action discussion below.

On April 20, 2011 two sediment samples designated CABC_01 and CABC_02 were collected at the confluence of channels A, B and C from a depth of 0.5 to 1 foot bgs. Samples were analyzed for a full range of parameters, including VOCs, SVOCs and PCBs. BEHP and PCBs exceeded the site-specific sediment criteria. SVOCs typical of roadway runoff and/or anthropogenic impact were also detected (data is summarized on **Figure 2.3.31-1**). The area represented by these samples was also excavated.

2.3.31.3 Soil Sampling

Soil sampling data are presented on three tables: **Table 2.3.31-4** (summary of PCB and, if applicable, BEHP results), **Table 2.3.31-5** (summary of extended parameter analyses) and **Table 2.3.31-6** (summary of QA/QC sample information). **Figure 2.3.31-2** shows the location of soil samples collected in this AOC.

Pre-2000 Soil Sampling at Channels B and C

In 1998 and 1999, soil borings were completed around Channel B to delineate PCB and BEHP detections in the channel sediments. **Appendix 51** is a letter of January 27, 2000 from URS to property owner Crown Pacific (Block 71 Lot 6) and it summarizes the soil boring data collected during this period. The soil boring data indicated a need for remediation of soils for PCBs and BEHP. One soil sample also exceeded the 100 mg/kg IGW SCC for DNOP. As the figure attached to the letter demonstrates, the soil impact on the offsite lot was delineated. In some locations, vertical impact was documented to 11 feet bgs. These deeper impacts were near an onsite area later found to have LNAPL impacts; onsite LNAPL and offsite impacts were excavated.

2007 Soil Sampling Event

The 2007 SAP included soil sample locations designed to evaluate the extent of a cap proposed for an engineering control. Soil samples collected for delineation of the proposed engineered cap were collected 20 feet west of each historical soil exceedance. Samples were collected from depths of 0-0.5 feet (AA-AB), and 1-1.5 feet (AC-AD) bgs. These samples were designated "CAP-B" or "OSA, OSB," etc. and are included on **Table 2.3.31-4.**

According to the SAP, seven isolated areas of historical PCB contamination exist within the adjacent property. These areas were sampled to determine the extent of a deed notice that would be required to restrict offsite parcels to non-residential use. Samples were collected at a distance

of 5 feet from the historical location that indicated PCB impact. Samples were collected from depths of 0-0.5 feet , and 1-1.5 feet bgs. Areas with previously reported PCBs deeper than 1.5 feet bgs were sampled to the previously reported depth; unless that depth was below water table. A depth to groundwater measurement was performed during the sampling event to confirm the groundwater depth.

The 2007 samples confirmed PCB impacts and most samples that exceeded a PCB content of 0.49 mg/kg were excavated as discussed below. Some isolated soil samples with PCB content above 0.49 mg/kg remain; these are shown on **Figure 2.3.31-2** and are demonstrated to be delineated. Additional remediation will be required for these delineated soil areas.

2.3.31.4 Surface Water Sampling

Surface water sample data is summarized on **Table 2.3.31-7** (analytical data) and **Table 2.3.31-8** (QA/QC sample information). **Figure 2.3.31-3** shows the location of the surface water samples discussed in this section and in Section 7.1.32.

Pre-2000 Surface Water Sampling

Surface water samples were collected in December 1998 and May 1999 to represent dry and wet weather conditions, respectively (URS, 2001). Samples were collected and analyzed for SVOCs, PCBs and metals (total/dissolved), alkalinity, TOC and hardness. The 2001 RAWP noted that arsenic was reported above SWQC in filtered samples but not in total metals analysis; the RAWP concluded these data were unreliable and recommended surface water sampling be conducted during the RI phase (**Appendix 5**, Volume I of the 2001 RAWP, URS).

2007 Surface Water Sampling

Surface water sample CB-2-SW was collected about midway along the length of Channel B, within the area identified by Woodward-Clyde as having a sheen in 1998. The surface water grab sample was collected on June 15, 2007 and analyzed for SVOCs and PCBs. BEHP was reported at 18 ug/l and Aroclor 1248 concentration was 3.5 ug/l.

Additional surface water sampling was conducted in 2014 and presented in section 7.1.32.

2.3.31.5 Remedial Excavations

Figure 2.3.31-1 shows the general location of scrape areas with respect to topography while **Figure 2.3.31-4** shows the post-excavation soil samples for the scrape areas. Because sampling data discussed above detected impacted sediment, soils and surface water in AOC 23, several scrape area excavations were completed. The table below summarizes which historical samples were targeted by the scrape areas, the COCs, and the highest remaining concentration of the COC demonstrated by post-excavation sampling. Where needed, additional text below describes individual scrape areas. **Table 2.3.31-1** summarizes scrape area post-excavation sediment sample results and **Table 2.3.31-4** presents the scrape area post-excavation soil sample results.

Scrape Area	Sample(s) Removed	COC(s)	Date(s) Excavated	Final Depth of Ex.	Highest Remaining Conc.(mg/kg)
X071	CM1, SW5B, CM15, CABC_01	PCBs	2/11/2011 and 3/22/2012	4 feet	0.71 mg/kg (sediment)
X072	CAP-B-60W, CAP-B-60W_5S, CAP-B-60W_5N, CAP-B-60W_5E, CAP-B-60W_5W, X072_02	PCB 1248 and 1254	12/17/2010	2 feet	0.44 mg/kg
X073	SB202 & 4 delineation locations	PCB 1248 and 1254	12/17/2010 3/2/2011	4 feet	0.37 mg/kg
X080	CAP-B-53 and delineation samples	PCB 1248 and 1254	1/23 to 1/26/2012 and 2/22/2012	6 to 7.5 feet	15 mg/kg (see text), then 0.35 mg/kg
X102	SB217, SB408, SB409, OSG-B1, OSG-B2 & delin., CAP-B-62 & delin, OSF-B2 & delin. ABC Outlet	PCB 1248 and 1254	Begin 2/13/2012; end 3/20/2012	4 to 5 feet	0.32 mg/kg
X103	CB2, CB3, CBMID,CM4, CM7, CP3, CP4, CP5, SED-5	PCB 1248 1254, BEHP	1/18 to 3/20/3 2012	3 to 6 feet	0.54 mg/kg PCB; 2 mg/kg BEHP (sediment)
X105	OSE-B1 and delin. samples	PCB 1248	2/3 and 2/7/2011	2 feet	0.12 mg/kg
X106	CC-4	PCB 1248	2/3/2011	3 feet	0.28 mg/kg
X107	SB208, SB208_5N	PCB 1248 1254 and BEHP	2/7 to 3/15/2011	3 feet	PCB 0.41 BEHP: 0.16 J
X108	CAP-B_57W and delin samples	PCB 1248 1254	2/7/2011	1 foot	PCB: ND at 0.093 mg/kg
X108A	Extension of X107 northward	PCB 1248 1254	3/15/2011	5 feet	PCB: 0.7 mg/kg
X109	CAP-B_55W and delin samples	PCB 1248 1254	2/1/2011	2 feet	PCB: ND at 0.084 mg/kg
X110	SB203, CAP-B_55W, CAP-B_56W & delin.	PCB 1248 1254	1/11/2012	2 feet	PCB: 0.27 mg/kg
X111	CAP-B_54W and delin. samples	NA – Re Excavated with X078 and X080			
X112	SB424 & delin. Samples	PCB 1248	2/1/2011	11 feet	PCB: 0.051 mg/kg
X113	SB209	PCBs	2/1/2011	3 feet	Non-Detect (0.76 mg/kg)
X114	CAP_B-50, OSB-B2, SB205, PEB_B-13, PEB_B-14, X083_01, 02, 03, 06 and 10.	PCBs, BEHP	1/16/2012	3 feet	0.26 mg/kg (PCB), 3.1 mg/kg (BEHP)
XB	"BERM" samples with	PCB 1248	1/26 to	Varies	PCB: 50 mg/kg

Scrape Area	Sample(s) Removed	COC(s)	Date(s) Excavated	Final Depth of Ex.	Highest Remaining Conc.(mg/kg)
	PCBs>0.49	1254	3/17/2011, 3/26 to 3/27/2012	up to 5 feet	

(1)Standards of comparison are on **Table 4.3-1.**

Scrape areas X107, X108 and X108A were located near the headwaters of Channel C in an area where the berm between Channel B and Channel C had a gap which could allow overflow from Channel B to Channel C, based on inspection of topography presented in the Hydrologic Modeling Study (1998). The location of these scrape areas and the impact that they addressed is consistent with the conclusion that no direct Hatco discharges to Channel C occurred in the past; rather, Channel C received occasional overflow from Channel B.

Scrape Area X071

This excavation technically addressed Channel A, but continued off the Hatco site and up to the culvert at River Road on the Woodbridge Township lot. Post-excavation samples were considered sediment and confirmed that remediation was complete in this area.

Scrape Area X072

Scrape Area X072 addressed a portion of Channel A (AOC 21A) that extended onto the Woodbridge Township lot. Scrape areas and samples associated with Channel A were discussed in Section 2.5.29 as AOC 21A. One eastern sidewall sample of X072 demonstrated PCB content in excess of 0.49 mg/kg in soil; this sample was excavated and post-excavation sampling results for the eastern sidewall of X072 are demonstrated by X071 (AOC 21A) because the two scrape areas coalesced. Scrape Area X072 extended to 4 feet depth.

Scrape Area X073

X073 addressed original 1998 soil boring samples SB202 and four delineation samples drilled around the original (SB202_5N, etc.). Samples from this scrape area were analyzed for PCBs. Aroclors 1248 and 1254 were detected in samples. Several post-excavation samples from the initial excavation on December 17, 2010 had PCB content above 0.49 mg/kg; these were excavated on March 2, 2011. The final excavation dimensions are shown on **Figure 2.3.31-4**. Remedial action completeness was demonstrated by five post-excavation soil samples.

Scrape Area X078

This scrape area was extended into AOC 23 from an onsite area associated with the LNAPL region. Former sample SB292 and delineation samples were removed by this scrape area. It is discussed further under AOC 2 (Section 2.5.2).

Scrape Area X080

The completed X080 is an irregularly shaped excavation that removed soil sample CAP-B-53 and the subsequent delineation soil samples collected around the original location. This area represented a significant hotspot, with PCB concentrations in excess of 100 mg/kg in some

samples. Detected PCBs were Aroclor 1248 and 1254. This scrape area abuts a large excavation completed to remove LNAPL in onsite areas and, although it extends to Channel B, it does not appear to be a result of water transport of contaminants along Channel B. Excavation depth ranged from 6 to 7.5 feet below grade. When X080 was completed, the highest remaining PCB content was technically 15 mg/kg at sample X080-11, but this sample was excavated in Scrape Area X081. Other samples demonstrate compliance with the 0.49 mg/kg RDC SCC.

Scrape Area X102

This area involved excavation of the portion of Channel C that exits Woodbridge Pond and joins with Channel B. The excavation included channel sediment and surrounding soils, which were likely impacted by overflows. This excavation abutted a larger north-south trending excavation that resulted in removal of approximately 530 feet of Channel B (Scrape Area X103, below). A total of 21 post-excavation soil samples, 10 of which were collected at depth, demonstrate removal of PCBs above 0.49 mg/kg for this scrape area.

Scrape Area X103

An approximately 530-foot segment of Channel B was excavated; excavation width ranged from 25 to about 45 feet. Samples removed in this excavation were sediment samples; post-excavation samples were also classified as sediment and are listed on **Table 2.3.31-1.** Excavation depth ranged from 3 to 6 feet below grade and post-excavation sediment samples demonstrated that remediation is complete for this excavation.

Scrape Areas X107, X108 and X108A

These three excavations were contiguous and address an area where there is a break in the berm which may have allowed runoff to move from Channel B to Channel C in high flow situations. At X107, post-excavation soil samples initially were analyzed for BEHP and PCBs due to a BEHP detection above 49 mg/kg in an SI sample. Because BEHP concentrations were low in initial post-excavation samples, remaining soil samples were not analyzed for BEHP. This area was a shallow excavation (3 feet) and the northern, eastern and western sidewalls of the excavation were delineated by Scrape areas X108A, BERM and X108 respectively. Excavation depth differences between the areas are not considered significant because this area is of concern for a surface release (i.e. “worst case” sidewall samples would be in the surface interval). Two post-excavation samples confirm that the bottom and southern side of the excavation removed PCBs at concentrations greater than 0.49 mg/kg.

X108 is confirmed complete at a depth of 1-foot by three post-excavation sidewall samples and a bottom sample (the fourth sidewall abutted X107).

X108A was a northward extension of X107; this excavation was confirmed by samples from the northern sidewall, eastern sidewall sample and bottom. The western sidewall abutted X108. The eastern sidewall sample PCB concentration was 0.7 mg/kg; however X103 was located about 14 feet to the east; post-excavation sample X103_4 provides lateral delineation with a PCB concentration of 0.48 mg/kg. The PCB content of the 14 foot wide soil between X108A and X103 may exceed 0.49 mg/kg, but is delineated.

Scrape Area X110

This was a 2-foot deep excavation to address prior samples that were analyzed for BEHP and PCBs but sample results indicated that only PCBs exceeded a soil criterion. Five post-excavation soil samples documented removal of soils with PCB content greater than 0.49 mg/kg. However, this area was later re-excavated as part of X078 (AOC 2) and the footprint of X110 was removed; thus samples associated with X110 are tagged as "excavated" in the database.

Scrape Area X113

This scrape area was an isolated location to remediate PCBs detected from a shallow soil sample at SB209. The 1.5-2 foot soil sample exceeded RDC SCC for Aroclor 1248. The original soil sample was analyzed for PCBs and SVOCs. A deeper soil sample from 5.5 to 6 feet depth was non-detect for PCBs. The scrape area is shown on **Figure 2.3.31-4**; PCBs were non-detect in five post-excavation soil samples.

Scrape Area X114

This excavation was initially located in Channel B, but extended eastward and coalesced with X083 (AOC 2) and both scrape areas included removal of the following samples:

- CAP_B-50 (a 2007 sample designed to investigate the extent of a proposed cap), along with delineation samples CAP_B-50_5N and CAP_B-50_5S and B-50W
- SB205 (a 1998 sample)
- OSB-B2

All of the above samples were designated "soil" matrix. Excavation X114 extended to 3 feet below grade. Post-excavation soil samples were analyzed for PCBs and results were below SCC.

Scrape Area XB

Berm sampling was completed as shown on **Figure 2.3.31-5** in September of 2010. As indicated on the topographic map (**Figure 2.3.31-1**), the area referenced as "the berm" is a linear north-south trending mound of material between Channel B and Channel C. Soil sampling was conducted along the length of the berm and PCBs in excess of 0.49 mg/kg were documented by the sampling.

Excavation "XB" was conducted along areas of the berm where samples (designated "BERM" on **Table 2.3.31-4**) indicated PCB concentrations above 0.49 mg/kg. There were two separate excavations on the northern and southern end of the berm with a clean zone in the middle. Soil samples were collected along the excavation sidewalls and bottom. When laboratory results indicated remaining soils contained PCBs in excess of 0.49 mg/kg, re-excavation was conducted by creating a secondary excavation at the location of the original post-excavation sample. Samples designated XB-17_01, XB-10_02, etc. were post excavation soil samples collected from around original post-excavation soil sample XB-17, for example.

At the completion of the XB excavation work, three post-excavation soil samples still indicated remaining material had PCB content greater than 0.49 mg/kg. These samples were all surficial (0-0.5 feet bgs) and indicate that additional remediation is required in this area. However, no

additional delineation is needed: **Figure 2.3.31-4** shows the XB post-excavation sampling results and the location of other nearby soil samples that are used to complete the delineation.

Additional remedial action is needed for soils at AOC 23, but delineation is complete. According to available data, remediation of sediment is also complete at AOC 23.

2.3.32 AOC 24: Woodbridge Pond

Woodbridge Pond is located on an approximately 5.6-acre parcel northeast of the intersection of Riverside Drive (formerly Industrial Avenue) and Mac Lane. This parcel is known as Block 71, Lot 7 of the Woodbridge Township Tax Maps and it is currently owned by Woodbridge Township. According to the New Jersey Association of County Tax Boards online records search, Woodbridge acquired the lot from Industrial Highway Corporation on September 25, 2012. At this time, the pond was renamed from "Morris Pond" to "Woodbridge Pond." Historical documents addressing this AOC, therefore, reference it as Morris Pond (or, in some 1960s era correspondence, as Brinkman's Pond). This RIR references the pond as Woodbridge Pond and the road to the south as Riverside Drive (formerly known as Industrial Avenue).

As scaled from NJGeoWeb's 2013 imagery, Woodbridge Pond is currently approximately 2 acres in size. It is bordered to the north and east by woods, shrubs, and phragmites. It is bordered to the south and west by embankments to the adjacent roadways. **Figure 2.3-1** shows the AOCs, including Woodbridge Pond. **Figure 2.3.32-1** provides a detailed view of AOC 24. Representative photographs of AOC 24 are included in **Appendix 52**.

Woodbridge Pond historically received runoff from Channel C (see Section 2.3.31). Historical reports indicate that runoff and discharges from the Hatco site and other offsite source areas reached Woodbridge Pond in the past (see Sections 2.3.32.1 and 2.3.32.2). Elevated concentrations of PCBs and BEHP associated with the Hatco site have been identified in sediments in the eastern portion of Woodbridge Pond. Runoff and discharges from the Hatco site were eliminated by:

1. Abandonment and closure of two former lagoons from November 2007 through January 2008 (AOC 1, see Section 2.3.1);
2. Remediation of Channels A and B in 2011 and 2012, which are located between the Hatco Site (AOC 23, see Section 2.3.31) and Woodbridge Pond, and;
3. Remediation of the Southeast Leg portion of the Hatco site during 2014 and 2015, which included LNAPL removal by excavation south and west of the existing chemical plant along with installation of a cutoff wall, recovery wells and recovery trenches to prevent migration of LNAPL that remains beneath the existing chemical plant.

The Woodbridge Pond property is located west of the Hatco Facility and south of a parcel owned by CP Properties, Incorporated, according to the New Jersey Association of County Tax Boards online records. The business located on the CP Properties parcel, north of Woodbridge Pond, is Crown Pacific New Jersey Corporation. Stormwater from Channel C (shown on **Figure 2.3.32-1**, and discussed in detail as part of AOC 23) feeds Woodbridge Pond from the northeast. Portions of Channel C found to contain PCBs above the remediation standards were excavated as part of

an approved remedial action to be reported separately in an RAR. As discussed in the conceptual site model (see Section 9.0), Woodbridge Pond is also fed by groundwater discharge. Surface water flows out of Woodbridge Pond via two channels. The primary discharge is from the southeast corner of Woodbridge Pond by the lower portion of Channel C that connects to Channels A and B. Weston has retained the naming convention for the channels as previously reported in the Hydrologic Modeling Study Report, prepared by Woodward-Clyde and dated October 1, 1998 (**Appendix 47**).

In addition, there is a small stream channel to the southwest of the pond that roughly parallels Riverside Drive. A culvert at the western end of this channel extends toward Riverside Drive and Mac Lane to the west.

2.3.32.1 Potential Impact from Hatco

Historical releases on the Hatco property reportedly resulted in contamination both on and off the Hatco site, including the adjacent stream channels. Direct discharges of Hatco wastewater were via an improved channel that emptied into Crows Mill Creek (Section 2.3.33); no direct discharges were known to have been routed from the Hatco site to Woodbridge Pond. Channel C's drainage area was modeled by Woodward-Clyde in the 1998 surface water study (**Appendix 47**) and included the upland portions of Lot 7 as well as a small swath of Hatco's property. It is assumed that historical discharges in the westernmost portion of the Hatco property reached Channel C via this pathway. However, based on available records, no historical spills from Hatco operations were reported in Channel C and no Hatco industrial operations were documented within Channel C's drainage area. Sediment sampling (discussed in Section 2.5.32) identified small impacted areas in the northern section of Channel C, upstream of the pond, and these were excavated as part of the NJDEP-approved remedial action work plan.

2.3.32.2 Potential Impact from Other Sources

PMK Group Consulting Engineers (PMK) prepared a Preliminary Assessment Report (PAR), dated July 30, 1996 for the property occupied by Woodbridge Pond and two parcels to the west of the pond (tax block 71 lots 1, 2 and 7). A copy of the PAR is provided in **Appendix 53**. According to the PAR, the three parcels were formerly owned by two chemical companies: Heyden Chemical Corporation (also Heyden Newport Chemical Corp) from 1951 to 1963 and Tenneco Chemicals (1963 to 1983). Heyden and Tenneco also owned the industrial parcels to the south, across Riverside Drive during the same time period. Heavy industrial operations including plastics production (by Catalin Chemical on the Heyden/Tenneco property), resins and phthalic anhydride processes, were ongoing at the properties to the south, across Riverside Drive.

The Woodbridge Pond property itself was the subject of apparent dumping, as recorded in the PAR (PMK, 1996). A site reconnaissance done during the 1996 Preliminary Assessment (PA) found evidence of dumping, including two corroded 55-gallon drums east of the pond; the report did not identify the drums as being related in any way to Hatco. The PMK PA Report also noted "Observations of the creek as it enters the property from the east indicate a heavy sheen as well as unknown product on the water." The report identifies a 12-inch diameter pipe discharging into the pond from the east and notes that the pipe is "reported to be a water main." A 20-inch

diameter water main, owned by Middlesex Water Company, is located between the Hatco site and Woodbridge Pond. This water main was relocated in 2012 in conjunction with the wetland restoration in AOC 23. The watershed for Channel C and Woodbridge Pond includes the upland portions of Lot 7 (**Appendix 47** Hydrologic Modeling Study, Woodard-Clyde, 1998), where the apparent (non-Hatco related) dumping was reported by PMK, and the Crown Pacific property.

The PA Report also reported evidence of dumping on the two parcels to the west of Woodbridge Pond (Lot 1 and Lot 2). On the lot immediately west of Mac Lane (Lot 2) there were approximately six full 55-gallon drums of unknown contents as well as numerous gasoline, paint and unidentifiable containers in various stages of decomposition. Appliance parts, automotive parts and stressed vegetation (the largest area being 100 by 50 feet) were also reported on Lot 2. On Lot 1 (westernmost property) a stream paralleling Riverside Drive was observed to have numerous paint, oil and unidentifiable cans. The stream banks were stained black and the water was covered with an oily product (PA, PMK Group, 1996).

2.3.32.3 Previous Environmental Investigations

Historical Surface Water Sample

The electronic database files received from URS as part of the RAWP dated 2001 indicate that a surface water sample was collected from Woodbridge Pond on February 27, 1998. The database indicates that the sample was analyzed for total suspended solids. None of the available historical reports document the purpose or procedures used to collect and analyze this sample.

PMK Site Investigation

On behalf of Woodbridge Township, PMK Group conducted a site investigation (SI) of Block 71, Lots 1, 2 and 7. The results of the SI were and provided results in a Site Investigation Report (SIR) (PMK, 1999). A copy of the SI Report (SIR) is included in **Appendix 54**. The SI included ten soil borings, biasing sample collection using visual cues and photoionization detector readings. Soil samples were analyzed for Priority Pollutant List (PPL) compounds and metals plus a library search (PP+40). Three groundwater monitoring wells were also installed and groundwater samples were collected and analyzed for PP+40. Surface water and sediment samples were collected from the ponds and analyzed for PP+40.

Soil samples from the Woodbridge Pond parcel had PAHs detected over direct contact standards (Plate 4, PMK SI, **and Appendix 54**). Soil samples collected from the other two parcels also had PAH concentrations above the direct contact soil cleanup criteria.

A sediment sample collected from Woodbridge Pond by PMK on August 12, 1999 was designated Pond-1A. According to the PMK SIR (1999), the sediment sample was analyzed for VOCs, SVOCs, metals, pesticides, pH and total organic carbon. No VOCs, pesticides or PCBs were reported at concentrations above the Lowest Effects Level for Freshwater Sediment Screening (LEL) in effect at the time of the sampling. In comparison to the current Ecological Screening Criteria (ESCs) and the site-specific ESC of 22 mg/kg for BEHP, BEHP exceeded the site-specific ESC at Pond-1A. One SVOC (phenol) and seven metals (arsenic, chromium, copper, lead, mercury, nickel and zinc) were reported at concentrations above the LEL in the sediment sample collected by PMK. A sediment sample from the westernmost pond collected by

PMK during the same sampling event also had arsenic, lead and copper over ESCs. PMK SI sediment sample results are summarized with other data for Woodbridge Pond on **Table 2.3.32-2** of this report.

According to the PMK SIR the Woodbridge Pond surface water sample was analyzed for VOCs, SVOCs, PCBs, pesticides and metals. Copies of the original laboratory reports are not available. Analytical results summarized in Table 8 of the PMK SIR present data only for the analytes that were detected in one or more of the surface water and/or sediment samples. The reported arsenic concentration exceeded the SWQC in the surface water sample from Woodbridge Pond. PMK SI surface water results are summarized with other data for Woodbridge Pond on **Table 2.3.32-1** of this report.

According to the SIR, three groundwater monitoring wells were installed on the three parcels and groundwater samples were collected and analyzed for PP+40. One of the monitoring wells was located on the Woodbridge Pond parcel. This well was designated by PMK as MW-1 and screened from 2 to 12 feet below grade. Groundwater was reported at 2 feet below grade at PMK MW-1. VOCs, SVOCs, pesticides, PCBs and metals did not exceed GWQC in PMK's sample from MW-1. However, lead exceeded GWQC in groundwater samples from the other two monitoring wells installed during the PMK SI on the properties to the west.

Weston Sediment Characterization and Remedial Actions Previously Reported

Between 2007 and mid-2012, Weston conducted multiple sampling events and one interim remedial action within Woodbridge Pond. **Table 2.3.32-3** is a summary of the samples collected and analyses run. **Figure 2.3.32-1** shows the sample locations.

To characterize the sediment in Woodbridge Pond, Weston collected sediment samples in June 2007. The Woodbridge Pond sediment samples were collected in accordance with the NJDEP-approved November 2006 *Sampling and Analysis Plan*. Sediment samples were collected at six locations designated CP-1 through CP-6. The sediment samples were collected from near the eastern edge of Woodbridge Pond (see **Figure 2.3.32-1**). Sediment samples were collected from 0- to 0.5 feet and from 1.0 to 1.5 feet at each location and analyzed for PCBs, TOC, and pH. PCB concentrations in the samples from CP-1, CP-2, CP-4, CP-5, C-6 and the shallow sample from CP-3 were less than 1 mg/kg. The reported PCB concentration in the deeper sample from CP-3 was 3.8 mg/kg. In August of 2007, four additional sediment samples were collected around original sample CP-3 to delineate PCBs that were reported at that location. This area was subsequently excavated (see discussion of Scrape Area X104 later in this section).

At the request of the USEPA and NJDEP, six additional sediment samples were collected from the inlet where Channel C (AOC 23) enters and leaves the pond. Samples were identified as CP-07 through CP-12. The sediment samples were analyzed for PCBs and BEHP. PCB concentrations in several of these samples exceeded 1 mg/kg indicating the need for further delineation. Results were presented in the Morris Pond Delineation Progress Report (Weston 2012, **Appendix 55**) and are summarized in **Table 2.3.32-4**. **Appendix 56** provides lithologic logs for the sediment cores.

Excavation as part of an approved Remedial Action Workplan was conducted to remove sediment at sampling location CP-3 identified in the June 2007 sediment sampling and subsequently delineated in August 2007. On June 28, 2011, the area around CP-3 was excavated. This excavation was referred to as Scrape Area X104 in Addendum 3 to the Consolidated Remedial Action Work Plan (RAWP). Post-excavation sediment samples X104_01 to X104_05 were analyzed for PCBs. The results of the post-excavation sediment samples were less than 1 mg/kg. A Remedial Action Report will be submitted separately.

In 2007 additional investigations were conducted around Channel C upstream of where it entered Woodbridge Pond and downstream where the pond drained out to join with Channels A and B. These investigations found PCB concentrations in soil requiring remediation (Section 2.5.31 of this report).

From June 2011 thru May 2012, Weston conducted six rounds of sampling to vertically and horizontally delineate PCBs and BEHP in Woodbridge Pond sediments. Samples were analyzed for BEHP and/or PCBs depending on results from shallower samples and/or adjacent samples. Results from these sampling events are presented in **Table 2.3.32-4**.

The 2011 sampling events included collection of four "outlet" samples from a swale on the southwest side of the pond. Samples CP_Outlet_01 to CP_Outlet_04 were collected from the surface and up to depths of 2.5 feet below the sediment surface. Sample results indicated concentrations below 1 mg/kg for PCBs and 22 mg/kg for BEHP (**Table 2.3.32-4**); therefore, no further sampling was required in this area.

Results of investigations through 2011 were presented to USEPA in a report entitled, "Morris Pond Delineation Progress Report" (Weston, August 2012, **Appendix 55**). In 2014, Weston collected additional sediment samples to complete delineation of PCB and BEHP contamination in the pond sediments and a surface water sample to provide data as necessary to obtain a discharge permit for the pond water. Results of this work are discussed in Section 7.1.13.

2.3.33 AOC 25: Channel D

AOC 25 is located offsite of the Hatco property and includes Channel D as defined in the Surface Water Modeling Study (Woodward-Clyde, 1998) (**Appendix 47**) and surrounding areas. Channel D was identified as a pathway for runoff from Hatco. Channel D is located on a parcel currently owned by EPEC (Block 62, Lot 2), but the area covered by Channel D-related investigations extends to Lots 100 and 100.01 of Block 77.

For the purposes of this RIR, AOC 25 is subdivided as shown on **Figure 2.3.33-1** based on the historical document analysis described later in this section. The following four areas comprise AOC 25:

AOC 25a: Channel D and the historical Crows Mill Creek channel including the associated drainage area. AOC 25a extends downstream to the point where historical disturbance and apparent discharge areas meet (see Section 2.3.33.3 for details).

AOC 25b: An area disturbance in the northwest corner of Block 62 Lot 2, first noted in an aerial photograph dated 1954.

AOC 25c: The area extending downstream from the point where AOC 25a and AOC 25b meet and including other areas of apparent disturbance and historical discharges not associated with Hatco site/operations.

EPEC AOC 4: An area of tar-like material adjacent to and south of the existing railroad right-of-way, identified in EPEC's investigative reports as AOC 4.

For purposes of this report, the entire area of investigation associated with AOC 25 and its subareas are referenced as "lowlands" or "marsh" because a formal Letter of Interpretation (LOI) was not obtained from NJDEP's Land Use Regulation Program. A GP-4 wetlands permit was obtained for sampling activities based on general mapping that identified the area as a likely wetland.

The data collected by Weston and others from Block 62 are presented in this discussion, regardless of which portion of AOC 25 are addressed by the sampling events. Delineation of BEHP and PCBs beyond the point at which multiple discharges appear to comingle (AOC 25c) has been completed as part of this RIR in accordance with NJDEP's policy regarding releases to impaired water bodies ("Investigating Impacts from Contaminated Sites to a Surface Water" posted November 25, 2015). As discussed in Section 2.3.31 above, several remedial actions have been taken to eliminate potential migration of impacted sediment and surface water from the Hatco site. Free product on the Hatco property has been delineated and the LNAPL body is contained following installation of containment barriers and excavation of LNAPL outside the containment (Section 6.5).

2.3.33.1 Summary of Hatco Industrial Discharge History Related to AOC 25

Hatco began operations in 1954; known industrial processes at Hatco are discussed in Section 2.1. Hatco plant wastewater discharge history is as follows, based on the 1994 RIR (DRAI):

- 1954 to 1966: Plant wastewater was discharged to surface water after settling in onsite ponds. During this period there was no visible connection to Channel D. It appears that the discharge went directly to Crows Mill Creek during this period.
- 1966 to 1967: Two lagoons (AOC 1) were constructed immediately north of Riverside Drive and plant discharges were routed to the lagoons, which were used for settling and flow equalization.
- 1967 to 1991: Onsite wastewater lagoon operation. The lagoons were taken out of service in 1991. Based on a 1965 engineering drawing (Elson T. Killam, Associates, Wastewater Treatment Facilities, November 5, 1965, **Appendix 57**) the lagoons were connected to the MUA but also had a 10-inch diameter emergency overflow to Channel A (which apparently emptied into Channel D).

Based on this history, plant wastewater discharge to AOC 25 would have occurred from circa 1954 to 1967. After that time period, episodic overflows may have occurred from the lagoon piping system until 1991. In 1991, the use of the lagoons was eliminated by disconnecting the lines discharging to the lagoons. Waste water/surface water flow was directed to the EPT, and an

impervious cover was installed to prevent contaminated sludge in the former lagoons from coming into contact with rainfall.

2.3.33.2 Historical Evaluation of Potential Releases to AOC 25

Changes in the locations of historical channels and apparent discharge areas is based on aerial photographic analysis using georeferenced historical aerials from 1931, 1940, 1947, 1954, 1957, 1963, 1969, 1972, 1979, 1987, 1995, 2002, 2006, 2007, 2008, 2010 and 2013. Key features on the photographs were digitized for comparison to GIS-referenced sample locations and site features. Historical topographic maps were also reviewed. Copies of the historical aerial photographs and topographic maps are in **Appendices 58 and 59**, respectively. **Appendix 58** also includes detailed discussion of the historical photograph and map review.

The following is a summary of the historical documentation analysis:

- Channel D and Crows Mill Creek alignments are first observed in 1940 but Hatco operations did not begin until 1954. The timing indicates that construction of Channel D was unrelated to drainage from Hatco operations. By 1940 other industries were already operating in the area.
- Hatco built a channel that apparently emptied into Crows Mill Creek during the time of their industrial operations. The channel was not visible on the 1957 aerial, but is clearly seen on the 1963 aerial). The channel was built prior to Hatco connecting to the MUA sewers circa 1966 and 1967;
- Hatco's channel configurations were changed after construction of two lagoons in 1967 (this change is first visible in the photograph dated 1969) to eliminate direct discharges;
- Evidence of an area of disturbance or discharge into the same lowlands where Channel D is located is noted near the intersection of the former Clay Railroad berm and Riverside Drive (AOC 25b). This area of disturbance or discharge appears to expand from roughly 4,000 square feet (s.f.) in the aerial photograph dated 1954 to roughly 49,000 s.f. in the aerial photograph dated 1963. It is also apparent in the aerial photographs dated 1972 and 1979;
- An apparent discharge occurred at the railroad track ("EPEC AOC 4" designated in EPEC property environmental investigations); this discharge is evident in the 1969 aerial photograph. There is no direct linkage between this apparent discharge and Hatco;
- The aerial photographs from 1940 through 1969 show what appears to be a drainage channel from Hartman's Pond discharging to Crows Mill Creek (the receiving stream for Channel D);
- Tributaries naturally drained from west to east across the EPEC properties (industrialized since about 1916) rather than flowing due south to the Raritan River. The earliest available documents (topographic map 1888) show this drainage pattern. Between the time of the 1940 and the 1947 aerial photographs, a new channel was cut on the western side of the EPEC properties that carried drainage from the western side of the property south to the Raritan;

- From the time of the 1957 to 1969 aerials, materials from the EPEC-lot industrial properties were observed on the eastern side of the former clay railroad berm in the area defined as AOC 25c;
- A ponded area north of the fill materials on the GreDel parcel (located adjacent to Crows Mill Creek on the eastern side) is visible on the 1969 and 1972 aerials. New channels originating on the GreDel property are also visible on the aerials. One of those channels paralleled the railway and would have brought runoff into the northern portion of Crows Mill Creek, just below the railroad; and
- Channels south of the GreDel property filling activities were also observed entering the area defined as AOC 25c (initially observed on the 1969 aerial).

All of the above represent potential pathways for impact to the lowlands area from Hatco as well as other industrial sources (**Figure 57**).

2.3.33.3 File Review of Potential Impacts to the Lowlands on Block 62 Lot 2

When the aerial photographic analysis indicated potential multiple source input for Block 62 Lot 2 lowlands, an initial review of key document submittals for offsite parties was conducted to evaluate the nature of operations and contaminants of concern present on those properties. The following resources were consulted in this initial analysis and are included in appendices as noted:

- **Appendix 60**: Brown & Caldwell 2009 Topographic Map
- **Appendix 61**: Case Inventory Document, Brown & Caldwell 2010 (submitted with the SRI)
- **Appendix 62**: Geraghty & Miller, Investigation of Ground-Water Quality Conditions (November 1982)
- **Appendix 63**: Nuodex 1985 ECRA Site Evaluation Submission
- **Appendix 64**: Impacts from Hatco Drainage on the EPEC Site (Brown & Caldwell, August 6, 2010)
- **Appendix 65**: Draft Deed Notice for the GreDel Property (2011)
- **Appendix 66**:August 12, 2010 Weston letter to NJDEP; findings of NAPL split-sampling, and September 9, 2010 letter from Weston to NJDEP – same issue

Detailed discussion of potential sources/operations of concern by direction with respect to AOC 25 is included in **Appendix 58** and summarized below.
Based upon a review of the above information, the following COCs are potential sources of impact for AOCs 25a, 25b or 25c:

- From Hatco: BEHP, PCBs
- From the West (Heyden/Catalin/Tenneco): VOCs, SVOCs, Lead and PCBs
- From the Northwestern Corner: Unknown Release – NAPL sampling by Brown & Caldwell indicated No. 6 Oil, Coal Tar Oil and PCBs

- From the North (Conrail tracks): Unknown Release – Brown & Caldwell sampling indicated PCBs, PAHs, CVOCs, benzene and naphthalene (Figure 5-5, March 2010 SRIR)
- From the East (GreDel filling): PCBs, PAHs, Metals (Deed Notice) – the Deed Notice data table specifically lists PCB concentrations up to 11.7 mg/kg, as well as ash, cinders and slag in some areas

2.3.33.4 Delineation Data for AOC 25

Environmental investigations associated with AOC 25 began in the 1980s and continued to 2014; hundreds of samples have been collected from surface water, sediment, soil and groundwater in the AOC 25 area and throughout the lowlands on Block 62 Lot 2 (EPEC property), Block 77, Lot 100.01 (GreDel property) and Block 77 Lot 100 (Woodbridge Township) as summarized below.

1998/1999 Surface Water Sampling

Surface water sampling data were collected initially in December 1998 and again in May 1999 to represent dry and wet conditions, respectively. Data were presented in the Remedial Action Workplan (RAWP, URS, 2001 **Appendix 5**). **Table 2.3.33-1** summarizes AOC 25 surface water sampling data. The 2001 RAWP states that the only site-related surface water contaminant was PCBs, and that PCBs in surface water were delineated at location SW-9. NJDEP provided comments by letter dated September 14, 2001.The NJDEP letter requested a revised work plan, but did not require additional action for surface water. The March 2001 RAWP was referenced in the Consent Order. Comments on the RAWP were carried through the Comprehensive RAWP in 2005 and the subsequent addenda. Those work plans also did not indicate the need for further delineation. For these reasons, the surface water delineation was considered complete. **Figure 2.3.33-8** shows the 1999 surface water delineation.

1998 Sediment Sampling

As noted in the discussion of Woodbridge Pond (AOC 24, Section 2.5.33), offsite sediment delineation and remediation goals were 1 mg/kg for PCBs and 22 mg/kg for BEHP. These values were used as criteria for data comparison.

As with surface water sampling data, the 2001 RAWP (URS, **Appendix 5**) provides a summary of the initial sediment sampling events at AOC 25. **Table 2.3.33-2** summarizes the 1998 sediment sampling results.

Samples collected in 1998 were analyzed for PCBs, PAHs and metals. Results were compared to NJDEP's Lowest Effects Level (LEL) from 1998 and PAHs did not exceed LELs in sediment samples from Channel D except for fluoranthene and pyrene in the location closest to Riverside Drive. Deeper sediment samples had no PAH concentrations above the 1998 LELs (URS Figure D-12 in **Appendix 5**).

The PCB result for the Channel D sample closest to Riverside Drive was greater than 1 mg/kg and PCB concentrations for two samples further downstream were less than 1 mg/kg.

Metals arsenic, cadmium, copper, lead and zinc exceeded LELs in some samples but these are not Hatco COCs. Source areas for these metals on the Hatco site are not present as indicated by the sampling data distribution shown on URS Figure 3-35 (**Appendix 5**).

2.3.33.5 2007 Sampling Plan – Sediment Results

On November 14, 2006, Weston submitted a Channel D Sampling and Analysis Plan (SAP) to NJDEP in response to NJDEP's request for additional soil/sediment sampling during the remedial design phase. The NDJEP-approved 2006 SAP specified that samples be collected at regular intervals down Channel D beginning at the culvert and continuing at least to 360 feet downstream. Samples would be collected approximately every 20 feet at the centerline of the channel and 20 feet away from the centerline of Channel D at three depth intervals up to 1.5 feet below the top of the sediment. Sample locations were biased toward depositional areas.

Sediment samples CD-02 through CD-63 were collected in 2007 (**Table 2.3.33-3, Figure 2.3.33-3** and **2.3.33-4**) at depths up to 3.5 feet below the sediment interface. Samples were analyzed for PCBs. Selected samples were also analyzed for BEHP, pH and Total Organic Carbon (TOC).

Based on available historical maps, aerial photographs and reports, sometime between 1990 and 1998 the surface water flow along Channel appears to have changed. From prior to 1940 until at least 1990, Channel D appears as a tributary of Crows Mill Creek. During that period, surface water in Channel D appears to have flowed from the Riverside Drive/Conrail right of way crossing in a southeasterly direction for approximately 300 feet before joining the Crows Mill Creek stream channel. The hydrologic evaluation reported by Geraghty & Miller in 1998 indicates that flow left that channel in a southerly direction discharging to a diffuse area approximately 300 feet south of Riverside Drive/Conrail Right of Way and approximately 150 feet west of the Crows Mill Creek stream channel.

Samples collected from Channel D indicated shallow impact (typically the top foot or two of sediment) and PCB concentrations of 5.9 mg/kg or less along the channel. Samples collected from the diffuse, wet area indicate that PCB impact is delineated at 3.5 feet below grade.

BEHP was analyzed at six sediment sampling locations in 2007. At two of those locations concentrations exceeded 22 mg/kg and at the other four locations BEHP was less than 22 mg/kg.

<u>2007 Sampling Plan – Soil Results</u>
Lateral step-out sampling with respect to the channel centerline was completed for 2007 Channel D sediment samples with analytical results exceeding a sediment standard. Some step-out samples were outside of the channel and classified as soils; results for the soil samples were compared to RDC SCC to assess delineation (0.49 for PCBs and 49 for BEHP). **Table 2.3.33-4** shows the 2007 soil sample results with comparison to RDC SCC.

Weston's Addendum No. 3 to August 18 2005, Consolidated Remedial Action Workplan, dated August 2009 (submitted to and approved by NJDEP), included the 2007 investigative results for Channel D **(Appendix 67**).

2.3.33.6 2010 Sampling Plan and 2011 Implementation

On March 15 2010, Weston provided a letter to NJDEP which concluded that Hatco COCs were phthalates (BEHP) and PCBs (**Appendix 68**). At a meeting on October 19, 2010 between Weston, NJDEP, EPEC representatives and others, it was decided that Weston would collect additional samples and analyze them for PCBs, phthalates and any CVOCs that would be detected in a library search (tentatively identified compounds). The meeting and its conclusions were referenced in the Channel D Sampling and Analysis Plan.

On December 13, 2010, Weston submitted a Revised Channel D Sampling and Analysis Plan which was approved by NJDEP **(Appendix 69**). The sampling plan included the following objectives:

1. Horizontal and vertical delineation of low-level PCBs detected in a drainage ditch upgradient of the EPEC property (along Riverside Drive and north of Middle Lake and West Lake – outside of areas investigated by Hatco consultants);
2. Vertically delineate EPEC sample location HD-2 (included in **Table 2.3.33-2**);
3. Horizontally delineate EPEC sample location HD-1;
4. Horizontal and vertical delineation of the current Channel D for PCBs and phthalates (see below).

Grid Sampling

In addition to the specific channel sampling, the NJDEP-approved Sampling and Analysis Plan proposed a grid sampling approach for the lowland areas. Grid spacing was approximately 30-feet on center and a total of 195 soil borings were planned. The southernmost boundary of the grid was "a lateral feature which extends from the railroad berm across towards the GreDel fill" and the Sampling and Analysis Plan stated, "Weston will not collect grid samples further south of this feature unless sample results indicate a contamination gradient attributable to former Hatco operations." Based on the historical aerial analysis completed in the current evaluation, the referenced feature was the channel connecting Hartman Pond to Crows Mill Creek.

Grid sampling also included the area defined as AOC 25b as well as the area defined as AOC 25a. The grid extended east of the Crow's Mill Creek channel.

Step Out Sampling

In areas where EPEC sampling identified PCBs above 1 mg/kg, 5-foot and 10-foot step out samples were collected and analyzed. Targeted sampling areas included eight EPEC soil borings along the eastern property boundary that needed delineation.

Samples were collected via hand trowels (surface soils), hand augers (deeper soil intervals), shovel (sediment) or dredge (Eckman or Ponar) for submerged sediment. Sampling followed the QA/QC protocols presented in the Sampling and Analysis Plan (**Appendix 69**).

Transect Observations

In addition to collecting samples, Weston field scientists created sampling transects spaced approximately 30 feet apart across AOC 25b. AOC 25b is the area observed in historical aerials as a discharge or disturbance and also the area reported by EPEC as a region of non-aqueous

phase liquids or NAPL. **Appendix 69** includes a map that shows the sampling transect locations and the results of observations along each sampling transect. **Appendix 69** also includes the photographs taken along the transects. Based on review of the photographs for this area, most of the material identified as a sheen or "product" appears to be natural meadow mat/decaying organic matter and/or iron bacteria. Weston notes that the area identified as "NAPL" by parties investigating the area on behalf of EPEC appears to coincide with the areas of AOC 25b and EPEC AOC 4.

Sediment and Soils Results Discussion

Table 2.3.33-5 shows sediment sampling results for BEHP and PCBs. Table **2.3.33-6** shows results of analysis for an extended parameter list that included target analytes besides PCBs and BEHP. **Table 2.3.33-7** presents the results of duplicate sample analyses and calculates %RPD for duplicate pairs.

Regarding soil samples, **Table 2.3.33-8** summarizes BEHP and PCB results for soil matrix samples. **Table 2.3.33-9** shows the results of extended parameter analysis (full SVOC list, for example) and **Table 2.3.33-10** displays duplicate pair QA/QC sample data for soils.

Figures 2.3.33-3 and **2.3.33-4** show PCB results in the northern and central portion of the lowlands. **Figures 2.3.33-5** and **2.3.33-7** plot BEHP results in data boxes. To aid the BEHP analysis, BEHP isopleth maps were created using Surfer® software (**Figures 2.3.33-6** and **2.3.33-7**).

Sample locations include transects through the southern extent of the EPEC lowland parcel and through the southern extent of the GreDel lowland parcel south of EPEC. Transects stop at the property line with Woodbridge Township.

For PCBs, the 1999 RDC SCC of 0.49 mg/kg was used as a data comparison for soils and 1 mg/kg for sediment. Any sample result above these reference concentrations is indicated in red on the figures. Samples with PCB content below 0.49 mg/kg (soil) or 1 mg/kg (sediment) were considered below regulatory concern.

It is important to note that some areas where PCBs were at comparatively high concentrations correspond to features on maps and historical aerials (**Figure 2.3.33-1**):

- CDG-102 area (PCBs up to 57 mg/kg) – Disturbed Area on 1954 to 1979 aerials. Vertical delineation to 0.49 mg/kg is achieved by the 2.0-2.5 foot sample.
- CDG-75 area (PCBs up to 78 mg/kg) – Erosional Feature on 2009 Topographic Map (Brown & Caldwell). Vertical delineation samples indicate that PCB concentration decreases below 0.49 mg/kg by 2.0-2.5 feet.
- CDG-142 and CDG-154 Area (PCBs up to 31 mg/kg) – Second Erosional Feature on 2009 Topographic Map. This area is delineated to 0.49 mg/kg at the 3.5 to 4.0 foot sample interval.
- CDG-116 is an isolated PCB hotspot of 400 mg/kg. This hotspot is one isolated sample that is horizontally delineated. There is no pathway from Hatco to this sample location as demonstrated by "clean" samples between Channel D and/or the historical 1954/1963

Crows Mill Creek channel and this location. It is adjacent to the fill placed by prior operators on the GreDel site and appears unrelated to Hatco.

Additional hotspots occur at the southern boundary of the EPEC parcel in an area which now has several ponds where the channel originating at Hartman's Pond, Crow's Mill Creek, GreDel's fill and AOC 25b coalesce (**Figure 2.3.33-1**). PCB concentrations in samples from these areas attenuate below 1 mg/kg for sediment and/or 0.49 mg/kg for soil by 2.5-3 feet, or in some isolated areas, by 3.5 to 4 feet below grade or the sediment interface.

As shown on **Figure 2.3.33-3** the PCB concentrations greater than 1 mg/kg in sediment and 0.49 mg/kg in soils extend to the northern portion of the GreDel-owned parcel. Sediment samples show disconnected hotspots of PCBs up to 300 mg/kg on this parcel. A sample from the 5.0-5.5 foot depth interval provides vertical delineation for these hotspots. Horizontal delineation is achieved at the eastern boundary beneath the fill placed in the GreDel property and at the western boundary along the former clay railroad berm.

Inspection of historical aerial photographs noted that ponded water accumulation was observed on the GreDel property concurrently with the filling operations in the 1970s. Samples from this ponded area were field classified by Weston as sediment and the samples were located an area where input from multiple sources could have mixed (as previously discussed above). The environment did not appear to be ponded in the 1954 and 1963 aerial photographs. The ponded area appears to coincide with the placement of a large volume of fill in the lowlands visible in the aerial photographs beginning with the 1972 aerial photograph and continuing to the present.

Samples CDG_304 through CDG_315 were constructed for the purpose of vertical delineation. In some locations PCB concentrations below1 mg/kg were not achieved at the deepest sample, which was 3.5 to 4 feet below the sediment interface. Based on other locations where sampling reached a depth of 5.5 feet and did complete the delineation, the PCB-impact is limited to the top 5 feet of material.

Figures 2.3.33-3, 4, 6 and **7** summarize BEHP results. **Figures 2.3.33-3 and -4** show the EPEC property lowlands. BEHP concentrations are highest in AOC 25b. The Surfer© contour plot illustrates this distribution without the data boxes. Locations of Channel D and Crows Mill Creek are superimposed for comparison. Filling operations that encroached on Crows Mill Creek channel appear to have redistributed/redirected BEHP impacts.

Figures 2.3.33-6 and **-7** show the GreDel parcel lowlands with summarized chemical data and BEHP isopleth contours, respectively.

The highest concentrations of both PCBs and BEHP occur in that region of the GreDel property where AOC 25b, a channel from Hartman Pond and Crows Mill Creek plus the GreDel fill material all appear to coalesce in ponded areas. Vertical delineation for soils and sediment in this area is achieved by the 5.0 – 5.5 foot depth sample for soil boring locations that were drilled to that depth. Western delineation is achieved at the former clay railroad berm. To the east, most areas are delineated beneath the fill placed on top of Crows Mill Creek. Eastern delineation was

projected in a small area (CD_GF03 and CD-GF16) by mathematical modeling (**Figure 2.3.33-6**, Surfer© contour plot).

The deepest BEHP impact was in the ponded area (CDG_163) where BEHP was delineated at 8 feet below the sediment interface.

Riverside Drive Drainage Ditch Sampling

EPEC had collected sediment samples in a drainage ditch paralleling Riverside Drive and attributed contaminants identified to Hatco (**Appendix 64**, samples HD-1 and HD-2). In 2011, four sediment samples were collected by Weston from the same drainage ditch on the south side of Riverside Drive. The SAP transmitted to NJDEP on December 13 2010 considered these samples to be "upgradient of EPEC." Samples EP_01 to EP_04 were collected on April 22, 2011 and analyzed for SVOCs and PCBs. These samples were situated to evaluate Brown & Caldwell's sample HD-2 which was collected from the same area.

PCB concentrations ranged from non-detect to 0.89 mg/kg (EPEC_B03 at 0.0-0.5 feet). Since these were sediment samples, they did not exceed the site-specific remediation goal of 1 mg/kg. BEHP was reported at 0.21 to 3.1 mg/kg. A sample collected by Brown & Caldwell (BC-EPEC-B2) at location EPEC_B02 had a reported BEHP concentration of 83.3 mg/kg, but this result was not reproduced.

SECTION 3.0
PHYSICAL SETTING

3.1 LOCATION

The 80-acre Site property is located on a predominantly industrial area in the town of Fords, Middlesex County, New Jersey. It is bordered by King George Post Road and residential properties to the north; State Highway 440 to the east; and commercial/industrial properties and water bodies (e.g. ponds and wetlands) to the south and west. The Site is approximately 4,000 feet north of the Raritan River **(Figure 1.1-1).**

3.2 TOPOGRAPHY AND DRAINAGE

The elevation of the Site property ranges from approximately 60 feet above msl at the northern boundary to approximately 20 feet above msl at the southern boundary.

Onsite surface water bodies include a reconstructed wetland and a stream. The reconstructed wetland is located south of the EPT Plant and is currently under restoration. The stream, named Sling Tail Creek, is located on the east side of the Site. It flows from north to south and ultimately discharges to a wetland area south of Riverside Drive (formerly Industrial Avenue).

Offsite surface water bodies include a stream, named Crows Mill Creek, as well as ponds and wetlands. Crows Mill Creek is located on the west side of the Site. Similar to Sling Tail Creek, Crows Mill Creek flows from north to south and discharges to a wetland area south of Riverside Drive.

Other drainage features include four channels identified as Channels A, B, C, and D (Woodward-Clyde, 1998). Channels A, B, and C are located north of Riverside Drive and west of the Site. They flow from north to south before converging and draining through a culvert under Riverside Drive. A single channel (Channel D) emerges from the culvert. This channel flows south into a wetland area. Channel C is the only channel that directly drains from the Site property (Figure 4.2-1). Details regarding the channels are presented in Sections 2.3.28, 2.3.31, and 2.3.33.

3.3 SOILS AND GEOLOGY

The soils at the Site are classified as atsion sand (AtsA) to the southwest and psamments (PstA) to the southeast (USDA – Natural Resources Conservation Service, 2016). Pits (PHM) from clay mining operations prior to 1954 are dominant to the north and east of the Site (Figure 4.3-1).

The Site lies along northern edge of the Coastal Plain Physiographic Province of New Jersey (Gerarghty & Miller, Inc., 1976). It is underlain by lowermost units of the Raritan Formation, which are the Farrington Sand and the South Amboy Fire Clay (formerly Raritan Fire Clay). The Farrington Sand consists of fine to medium sand interbedded with thin to thick, dark silt beds (Owens, 1995). The South Amboy Fire Clay is massive to laminated, and variable in color (Sugarman, et al. 2005).

Boring log data from previous RIs conducted at the Site indicate that the stratigraphy consists of a complex sequence of interbedded sand, silt and clay layers. In general, the top 10 feet is composed of fine-grained sand, silt and clay fill that is underlain by an approximately 10-foot-thick layer of poorly sorted sand with minor discontinuous silt and clay layers. This upper sand layer is underlain by a continuous layer of gray clay that is 2-8 feet thick. The clay layer is underlain by a second layer of sand and silty sand that extends down to the bedrock surface at a depth of about 40-50 feet (as reported in the 1993 RIR, **Appendix 9**).

3.4 HYDROGEOLOGY

Groundwater is found at a depth of between 3 and 15 feet (ft) below grade in the fill and upper sand layers. In general, groundwater is deeper in the northern and eastern portions of the site and becomes shallower to the west and south. Groundwater is unconfined in the northern portion of the site but transitions to confined conditions in the southern areas. Artesian conditions have been observed in one groundwater monitoring well, MW-57, which is located in the southern portion of the site and groundwater seeps have been observed in the area of the recently reconstructed wetland and the channels near the western site boundary. Groundwater flow is generally to the south where it discharges to a large wetland south of Riverside Drive. However, there is a minor component of flow to the west, toward smaller wetland areas. The hydraulic conductivity of the upper sand layer ranges from 20 to 70 ft/day based on a pumping test conducted the Site (1993 RIR**, Appendix 9**). The overlying sand, silt and clay fill has a hydraulic conductivity of less than 1 ft/day based on slug tests. The groundwater gradient for the shallow zone is approximately 0.01 to the south.

3.5 SEASONAL EVENTS AND VARIATIONS

No seasonal events or variations that would adversely affect investigation data or results have been reported.

SECTION 4.0
REGULATORY INFORMATION

4.1 REGULATORY TIMEFRAMES

The subject site carried an obligation to remediate that predated May 7, 1999; for this reason, the site was subject to a statutory deadline to complete an RI by May 7, 2014. The site applied for and was granted an extension for the RI to May 7, 2016. The current document is intended to document completion of the RI phase. It is submitted with an updated receptor evaluation (SECTION 9.0) and a Classification Exception Area (CEA) proposal (Section 8.2).

A Remedial Action (RA) will be required to have been implemented by May 7, 2020. Portions of the RAs have been initiated and/or completed onsite including LNAPL containment and removal, soil excavation, lagoon sludge remediation and other actions. RA reports are pending for completed actions.

LNAPL was first discovered onsite in 1992; LNAPL has been reported, delineated, and remedial measures were implemented as discussed in Section 5.2.

Vapor Intrusion (VI) investigations were triggered by the presence of VOCs at concentrations above Ground Water Screening Levels (GWSLs). VI investigations were conducted and reported as part of the receptor evaluation (SECTION 9.0).

No obligation for potable well sampling has been found following an updated well search and a door-to-door canvass (Section 9).

4.2 VARIANCES AND DEVIATIONS

The RI uses data generated beginning in the 1980s. Based on review of prior consultant reports, the data quality and collection procedures were in substantially in agreement with standard practices and the level of care exercised by environmental professionals practicing at the time. QA/QC procedures also followed the industry standards at the time. Additionally, much of the investigation data for the site was previously submitted to and approved by NJDEP during the time period pre-dating the Site Remediation Reform Act (SRRA)/LSRP Program.

It may be noted that older data does not achieve the current standards with regard to specific aspects such as method detection limits (MDLs) and compound lists. Improvements to analytical procedures have resulted in lower detection limits in 2016 than were available in 1988. For this reason, data tables follow a convention where data with known MDLs exceeding a regulatory standard of comparison, are highlighted, flagged or placed in bold text as appropriate. Compound lists have been updated from the Priority Pollutant List (PPL) to the Target Compound List (TCL) and Target Analyte List (TAL). For AOCs where the updated analyte lists were used, no new COCs were identified.

No variances and deviations have been identified beyond the inherent limitations present in use and reliance upon data that is decades old. In most cases, modern data have been collected for a broad suite of analyses to confirm the conclusions reached by using older data.

4.3 REGULATORY STANDARDS

As noted in the regulatory history of this site, a comprehensive RAW was approved in 2005, which enables use of the standards in effect at the time of the approved RAW except in cases where:

(1) New standards were developed for constituents that did not originally have a standard; or
(2) New standards changed by more than an order of magnitude.

In the latter case, the new standards must be used rather than the standards in effect at the time the RAWP was approved. **Table 4.3-1** shows the regulatory standards used for comparison for this RIR. Accordingly the soil remediation standards are the NJDEP Soil Cleanup Criteria (May 1999).

Exceptions to the SCC include a risk based standard for PCBs of 1 mg/kg for offsite sediment, 2 mg/kg for onsite sediment (**Appendix 1**). Based on a Technical Consultation with NJDEP (**Appendix** 92) an ecological standard of 22 mg/kg for BEHP was proposed for AOC 24 and also applied to AOC 25. A site-specific remediation standard for the impact to groundwater pathway for naphthalene was also derived using the SPLP methodology (**Appendix 97**).

SECTION 5.0
INTERIM REMEDIAL ACTIONS AND LNAPL DELINEATION

5.1 REMEDIAL ACTIONS

Remedial actions will be reported separately in an RAR. Where data from previously unreported remedial actions were needed to demonstrate delineation and completion of the RI, the data are presented in this report. Remedial actions were implemented in accordance with the Hatco Consolidated Remedial Action Workplan (Weston, 2005) and associated documents, included as **Appendix 70**. Remedial actions implemented included excavations of scrape areas and the implementation and post-excavation sampling of the scrape areas was governed by the following:

- Addendum No. 3 to the Consolidated Remedial Action Work Plan (August 2009) (**Appendix 67**), as approved by NJDEP
- 2014 Scrape Areas: Field Sampling Plan (Weston, February 2014) (**Appendix 71**)
- Revised Quality Assurance Program Plan (Weston, August 22, 2014) (**Appendix 72**)

Only those remedial actions needed to confirm delineation for the site are discussed in this report.

5.2 NON-AQUEOUS PHASE LIQUIDS DELINEATION

5.2.1 Introduction

Since 1979 multiple investigations were conducted to characterize and delineate, soil, groundwater, surface water, sediment and LNAPL contamination at the Site.

Weston performed several investigations of LNAPL contamination at the Hatco site between 2006 and 2007 to mainly determine the horizontal and vertical extent, composition and thickness of the LNAPL plume, as detailed in Weston's *2007 Data Progress Report dated December 17, 2008*. A copy of this report is included as **Appendix 29**.

5.2.2 LNAPL Occurrence

The source of the LNAPL is not definitively known, nor are the date or volume of the initial release(s). Based on distribution of the LNAPL, it is likely that there were historical releases within the Ester 1 Tank Farm, the Acid Tank Farm, and/or the Main Production Area (**Figure 2.3-1**).

Between 1997 and 2009 several site investigations were conducted to define the lateral extent and thickness of the LNAPL area. Figure 3-22 of the *2005 Consolidated RAWP* (**Appendix 70**) depicts the interpretation of the LNAPL area, which was revised after 2007 soil investigation. The findings are discussed in the *2007 Data Progress Report* (**Appendix 29**). Based upon these investigations two main areas of LNAPL were identified. One area extends from the central portion of the chemical plant southward to just north of the former Lagoon Area (AOC 1). A

second area lies within the former Muck Area (portion of AOC 2). The final outline of the LNAPL plume is depicted on the Figure 2 *Revised Interim Remedial Measure Plan Remedial Action Work Plan (IRM RAWP) dated February 2010* (**Appendix 73**), as approved by NJDEP. The LNAPL area was approximately 800 feet long and varies in width from 100 feet to nearly 400 feet.

In 2010 Weston remediated the south-west leg of the plume and collected confirmatory post excavation samples, the results indicated the contaminant concentrations for PCB and BEHP are below the remediation goals. A detailed discussion on the excavation and post excavation sampling results are reported in *Remedial Action Progress Report Phase II Wetlands Remediation Summary dated September 2012* (**Appendix 74**).

Isolated occurrences of LNAPL were also identified in the area of monitoring wells MW-5S, MW-50S and TF1/P12. Monitoring wells MW-50S and TF1/P12 were determined to contain between 1 to 2 feet of LNAPL. In October 1998, measurable LNAPL thickness in MW-5S was detected at 0.01 foot. Delineation boring investigation was performed at TF1/P12 and MW50S to better define the horizontal extent of "isolated occurrences of LNAPL" measured at these locations. Results of the soil boring program indicate that no LNAPL was detected in soils adjacent to each of these monitoring well locations. Details for the LNAPL observations and associated PCB concentrations at soil borings near TF1/P12 and MW50S are provided as Attachment 5 of the *2007 Data Progress Report* (**Appendix 29**).

In March 2014, Weston advanced two soil borings (X029-6, and X029-9) to horizontally and vertically delineate the extent of PCB and BEHP contamination at Scrape Area X029. During this investigation, Weston encountered trace to residual product at the depth of 9.5 to 10.5 ft. below grade surface. In September 2014, Weston advanced three delineation soil borings (X029-8, X029-8A, and X029-9) to confirm the vertical extent of free product at Scrape Area X029. During this investigation Weston did not encounter any free product as indicated in the soil borings. On March 22, 2016, Weston mobilized Advanced Drilling of Pittstown NJ, to horizontally and vertically delineate the extent of LNAPL around Scrape Area X029. Seven soil borings (X029-10, X029-11, X029-12, X029-13, X029-16, X029-20 and X029-21) were advanced approximately 15 ft. bgs and did not encounter any free product as indicated in the soil borings. The location of the soil borings are identified on **Figure 5.2.2--1.**

As part of the Southeast Leg remedial action in 2014 and 2015, Weston excavated the remaining accessible soils containing LNAPL from the southernmost portion of the site. As part of the remediation projects, Weston installed five recovery trenches and a vertical barrier wall to the north of these excavations to prevent LNAPL migration from beneath the inaccessible active plant into the excavated areas. A separate report will be submitted, which will summarize the remedial action activities implemented at the Southeast Leg.

Based on an evaluation of historical data Weston estimated roughly 40,000 gallons of LNAPL beneath the site prior to 2005. Ongoing recovery operations have reduced that volume by an estimated 36,842 gallons. This total includes:

- 8,642 gallons recovered using skimmers and bailers since March 2011;

- 3,200 gallons recovered and shipped offsite in liquid phase during the SE Leg remediation, and;
- 25,000 gallons estimated in LNAPL-saturated soils shipped for offsite disposal during the SE Leg remediation (calculated based on pore volume).

The barrier wall defines the current the southern limit of LNAPL at the site. The northern, eastern and western limits were delineated as described above. Ongoing recovery operations have reduced the volume of LNAPL, which will continue in the foreseeable future.

5.2.3 LNAPL Characteristics

The LNAPL found at the Hatco site is composed primarily of phthalates and PCBs. Several rounds of LNAPL fingerprint and analytical samples have been collected from various monitoring well and temporary well points since 1992, including two rounds of samples collected by Weston (2006 and 2007).

The *2005 Consolidated RAWP* (**Appendix 70**) describes the LNAPL at the Hatco site as containing Aroclor-1248 and phthalates, with similar viscosities and specific gravities. Samples of LNAPL also contained benzene, xylenes and toluene. Results from 1992 to 1999 LNAPL sampling are provided in Table 4-1 of the *2005 Consolidated RAWP*.

Weston performed additional analyses to confirm previous findings. During 2006 and 2007 LNAPL samples were collected from six monitoring well locations for LNAPL fingerprint analysis, including MW-17S, MW-32, MW-43, MW-50, MW-52S, and TF/P-5. These wells were sampled in both March 2006 and September 2007. Analytical results and fingerprint analysis indicate that LNAPL is similar in composition across the site. All of the samples contained the PCB Aroclor 1248 and phthalates, and have similar specific gravities and viscosities. Nearly all of the samples contain benzene toluene and xylene. (**Tables 5.2.3-1 and 5.2.3-2**, and **Figure 5.2.3-1**). A full laboratory deliverable, plus laboratory discussion, is provided as Attachment 2 in the *2009 August – LNAPL Investigation Summary* (**Appendix 75**).

5.2.4 LNAPL Thickness

During 1997 and 1999 the measured LNAPL apparent thickness in wells and piezometers ranged from sheen to 7.29 feet in these areas. LNAPL apparent thickness measurements in monitoring wells made in 2006 and 2007 throughout the plume showed that the observed apparent product thickness ranged from sheen to about 6 feet. **Table 5.2.4-1** includes the available LNAPL thickness data collected from the monitoring well/piezometer for the period of January 1992 through June 2007 LNAPL plume delineation.

5.2.4.2 *Bail-Down Test Results*

As discussed in the *December 2007 Excavation Pilot Test Summary Report*, bail down testing was conducted by Weston in February 2006 to evaluate the actual LNAPL thickness and to provide data on recovery. Bail down testing was performed at monitoring wellsMW-17S, MW-

32S, MW-43S, MW-50S, MW-52S and TF1-P5 Results of the bail-down tests indicated that the product thickness in the tested wells was at about 0.1 to 0.2 feet.

5.2.4.3 *UVIF-Cone Penetration Testing Summary*

During two rounds of testing in November 2007 and January 2008, a total of 27 ultraviolet-induced fluorescence (UVIF) cone penetration tests (CPTs) and 4 non-UVIF CPTs were performed within the Hatco site to assess the vertical distribution of LNAPL. Based on CPT UVIF testing, the observed apparent thickness ranged from 3 to 6 feet. Refer to *February 2010 Revised Interim Remedial Measure Report* for further details (**Appendix 73**).

5.2.5 LNAPL Physical Characteristics/Properties

The LNAPL consists of a mixture of phthalate esters, ketones, and plasticizers with an average specific gravity of 0.95. The average viscosity of the LNAPL is 28.5 centipoise (cP). The average surface tension of the LNAPL is 33.2 dynes/cm. The average interfacial tension is 23 dynes/cm. The relatively high specific gravity (very close to water) and low viscosity and surface tension allowed the LNAPL to flow easily through the subsurface. Although the LNAPL is mobile within the subsurface, historical monitoring of the LNAPL plume since the early 1990s indicates that it has reached equilibrium with the groundwater system and is no longer migrating. LNAPL migration is limited by the confined groundwater conditions in the southern portion of the site.

As discussed in the *February 2010 Revised Interim Remedial Measure Report* (**Appendix 73**) the LNAPL saturated hydraulic conductivity was estimated by applying the Bouwer and Rice (1976) method to the bail down test data. The average LNAPL saturated hydraulic conductivity was calculated to be approximately 2 ft/day. Based upon the two pilot studies conducted in December 2007, and June 30 to July 2, 2008, Weston determined that the mobile LNAPL is found only in coarse-grained sandy deposits and LNAPL readily drains from the sandy soils leaving residual PCB concentrations of less than 100 mg/kg, also well below the cleanup goal of 500 mg/kg dry weight. A detailed discussion of the pilot studies are included in *Progress Report – First Pilot Study dated May 8, 2008 and Progress Report – Second Pilot Study dated October 29, 2008* (**Appendix 75**).

SECTION 6.0
QUALITY ASSURANCE AND QUALITY CONTROL

Quality assurance/quality control (QA/QC) samples were collected in accordance with Weston's QAPP, included as part of *Addendum 3.* The QAPP also satisfies applicable NJDEP requirements for QAPPs, pursuant to the TRSR and NJDEP guidance. Laboratory-blind field duplicate and matrix spike/matrix spike duplicate (MS/MSD) samples were collected at a rate of 1 per 20 samples per analytical parameter. Field blanks were collected once per day per matrix and analyzed for the same parameters as the field samples.

Records of field procedures, tests and observations were recorded in a field logbook and in Weston's electronic field log program. Entries in the log book included the names of the individuals participating in the field effort, date and time, and the initials of the individual responsible for recording the observations.

To maintain a record of sample collection, transfer between personnel, shipment, and receipt by the laboratory, standard chain-of-custody forms were completed for all samples. The form accompanied the samples to the laboratory. Signed and dated custody seals were applied to sample shipping containers which consisted of coolers chilled with ice for transport to the laboratory.

Reusable sampling equipment was decontaminated before and after each sample location. Decontamination procedures followed technical requirements as set forth in the NJDEP *Field Sampling Procedures Manual* (August, 2005). Equipment was decontaminated in the following sequence: 1) a steam/high-pressure water wash; 2) a potable water and soap wash; and 3) a distilled and deionized (ASTM Type II) water rinse.

For samples collected in an area with suspected PCB concentrations above the U.S. Environmental Protection Agency (EPA) Toxic Substances Control Act (TSCA) limit of 50 milligrams per kilogram, a TSCA-compliant decontamination procedure was performed. Wipe samples were collected and analyzed for PCBs to confirm the efficacy of the TSCA-compliant decontamination prior to removing the decontaminated equipment from the site.

6.1 Duplicate Sample Results

6.1.1 Sediment Duplicate Sample Results

Table 2.3.31-3 compares results for duplicate sediment samples collected on September 4, 2007. Two different Aroclors were reported in the two duplicate samples. The laboratory reported 0.17 mg/kg of Aroclor 1254 in the original sample, B_NORTH-AC-AD-0. The laboratory reported a similar concentration, 0.18 mg/kg, in the duplicate sample, CB_NORTH-AC-AD-1, but identified the PCB as Aroclor 1248. Therefore, while the total PCB concentration reported appears to be consistent, the specific Aroclor mixture reported by the laboratory was not reproduced. Weston considers the reproducibility of the total PCB concentrations to be adequate for this project.

Table 7.1.14-3 presents total PCB and BEHP concentrations reported in 13 samples and associated duplicate samples collected by Weston. PCBs were not detected in one or both of the seven duplicate sample pairs collected on August 23, 2007, June 27, 2011; December 13, 2011, January 27, 2012, and May 21, 2012. Relative percent differences could not be calculated for these data. Relative percent differences for total PCB concentrations reported in the remaining six pairs ranged from 8 to 87 percent. BEHP was not analyzed during the sampling events on June 18 and August 23, 2007. BEHP was not detected in one or both of the six duplicate sample pairs collected on June 27, 2011; December 13, 2011, January 27, 2012, and May 21, 2012. Relative percent differences could not be calculated for these data. Relative percent differences for total PCB concentrations reported in the remaining five pairs ranged from 9 to 158 percent. The variability in concentrations is attributable to variations in the sediment matrix and organic content.

6.1.2 Soil Duplicate Sample Results

Table 2.3.31-6 presents analytical results for 17 soil samples and associated duplicates collected during sampling activities in 2007 and 2011. PCBs were not detected in 5 of the 17 pairs. Calculated RPDs for the remaining 12 pairs ranged from 2.4 to 36.2 percent indicating good reproducibility.

6.1.3 Surface Water Sample Results

Table 7.1.14-5 presents analytical results for two surface water samples and associated duplicates. Only BEHP was detected in the pair collected on March 25, 2014. The remaining results were below detection limits. The RPD for BEHP in the duplicate sample pair from March 25, 2014 was 2 percent, indicating good reproducibility.

SECTION 7.0
SUPPLEMENTAL REMEDIAL INVESTIGATION BY AREA OF CONCERN

This section presents the results of work performed by Weston that completed delineation of the AOCs discussed in Section 2.3. Based on the historical sampling efforts, the following 18 AOCs were determined to be uncontaminated or delineation was completed:

- AOC 2: Former Ponds
- AOC 3: Rail Siding Area
- AOC 4: Ester 1 Building and Acid Tank Farm
- AOC 6: Phthalic Anhydride Process Area
- AOC 9B: Alcohol Tank Farm
- AOC 9C: Naphthalene Tank Farm
- AOC9D: Scales Tank Area
- AOC 9E: No. 6 Fuel Oil ASTs
- AOC 10A: Current Drum and Waste Storage Area
- AOC 10C: Former Drum and Waste Storage Area (West of Warehouse 4)
- AOC 11A, B and C: Maintenance Building Tank Areas
- AOC 12: Transformers
- AOC 15: Site-wide Groundwater
- AOC 16: Research and Development Laboratory
- AOC 17: Clean Fill Area
- AOC 19: ZAA Process Area
- AOC 21A: Channel A
- AOC 22: Sewer System

Therefore, Weston did not perform additional work or evaluate remediation data to complete the delineation of the AOCs listed above. This section discusses the supplemental remedial investigation of the remaining 15 AOCs:

- AOC 1: Closed Former Lagoons
- AOC 5: Ester 2 Building and Areas to the East and South
- AOC 7A: Phthalic Anhydride Residue Area
- AOC 8: Tarry Area
- **Error! Reference source not found.**
- AOC 10B: Former Drum and Waste Storage Area (North of Warehouse 5)
- AOC 13: Southeast Fill Area
- AOC 14: Naphthalene Area
- AOC 18A: Pilot Plant 1
- AOC 18B: Pilot Plant 2
- AOC 20: Area East of Sling Tail Creek
- AOC 21B Sling Tail Creek
- AOC 23: Channels B and C
- AOC 24: Woodbridge Pond

- AOC 25: Channel D

Much of the delineation relies on post-excavation data from various scrape areas that were completed as part of the planned remedial action for the site. Data previously presented for the scrape areas are included in the following reports which are provided as appendices:

- Remedial Action Progress Report dated November 19, 2010 (**Appendix 76**) (Onsite RAPR)
- November 19, 2010 On-Site Remediation Progress Report Addendum dated September 26, 2011 (**Appendix 77**) (RAPR Addendum)
- Remedial Action Progress Report, Phase I Wetlands Remediation Summary dated September 26, 2011 (**Appendix 78**) (Phase I Wetlands RAPR)
- Remedial Action Progress Report, Phase II Wetlands Remediation Summary dated October 2, 2012 (**Appendix 79**) (Phase II Wetlands RAPR)

Following is a summary by AOC of scrape areas with data used for delineation purposes and the associated report, where applicable.

AOC	Scrape Area	Report	AOC	Scrape Area	Report
1	X050	Phase II Wetlands RAPR	20	X014	Onsite RAPR
1	X051	Phase II Wetlands RAPR	23	X071	Phase II Wetlands RAPR
5A	X028	Onsite RAPR	23	X072	Phase I Wetlands RAPR
5A	X029	Not previously reported	23	X073	Phase II Wetlands RAPR
5A	X042	Onsite RAPR	23	X078	Phase II Wetlands RAPR
8	X023A	Not previously reported	23	X080	Phase II Wetlands RAPR
8	X023B	Not previously reported	23	X082	Phase II Wetlands RAPR
8	X024	Onsite RAPR	23	X102	Phase II Wetlands RAPR
8	X025	Onsite RAPR	23	X103	Phase II Wetlands RAPR
8	X026	Onsite RAPR	23	X105	Phase I Wetlands RAPR
8	X027	Onsite RAPR	23	X106	Phase I Wetlands RAPR
10B	X001	Not previously reported	23	X107	Phase I Wetlands RAPR
10B	X013	Not previously reported	23	X108	Phase I Wetlands RAPR
13	X017	Onsite RAPR	23	X108A	Phase I Wetlands RAPR
13	X019	Onsite RAPR	23	X109	Phase I Wetlands RAPR
13	X022	Onsite RAPR	23	X110	Phase II Wetlands RAPR
14	X012	Onsite RAPR	23	X111	Phase II Wetlands RAPR
14	X137	Onsite RAPR	23	X112	Phase I Wetlands RAPR
18A	X131	Onsite RAPR	23	X113	Phase I Wetlands RAPR
18A	X133	Onsite RAPR	23	X114	Phase II Wetlands RAPR
18B	X128	Onsite RAPR	23	X139	Phase I Wetlands RAPR
18B	X130	Onsite RAPR	23	XB	Not previously reported

7.1.1 AOC 1: Closed Former Lagoons

As discussed in Section 2.3.1, historical sampling delineated contamination associated with the Closed Former Lagoons with the exception of the southern boundary. Delineation to the south of this AOC was accomplished by post-excavation sampling of two scrape areas designated X050 and X051. These two excavations were completed by Weston between June 27 and August 11, 2011 as part of planned remediation activities previously approved by NJDEP. Results of this work were documented in the Remedial Action Progress Report, Phase II Wetlands Remediation Summary, dated October 2, 2012. A copy of that report is provided in **Appendix 79.**

Scrape Area X050 was excavated from the southern concrete wall of the lagoons to the curb of Riverside Drive. The lagoons have a retaining wall and no post-excavation soil samples could be collected on the northern side of the excavation because the retaining wall formed the northern extent of the excavation. The excavation was 5 by 16 feet by 2 feet deep and completed on June 27, 2011. A second round of excavation July 18, 2011 (based on initial post-excavation soil sampling results) deepened the original excavation to 3 feet and widened it on the east and west ends. Post-excavation soil sampling confirmed that benzo(a)pyrene (the COC detected in the original sample removed by the Scrape Area) was below the most stringent SCC. RI is complete for benzo(a)pyrene at AOC 1.

Scrape Area X051 was dug next to the sewer connection vault south of the lagoons. The excavation was about 8 by 10 feet and 9 feet deep. This excavation was also initiated on June 27, 2011 and completed on August 11, 2011 with second and third rounds of excavation. The excavation was widened in the southern and eastern directions but not deepened. Excavation was conducted up to the side of the sewer vault.

Post-excavation soil samples confirmed PCB concentrations below NRDC SCC.

The scrape areas complete the vertical and horizontal delineation of lagoon constituents to the south of the lagoons. Lagoon soil boring LGN-6 (**Figure 2.3.1-1**) was not vertically delineated, but Scrape Area X139 (AOC 23) can be used to complete the delineation. This scrape area was excavated to 9 feet depth and the bottom sample confirmed PCB concentration below SCCs. Results for Scrape Area X139 are presented in the Remedial Action Progress Report, Phase I Wetlands Remediation Summary report (see **Appendix 78**).

7.1.2 AOC 5: Ester 2 Building and Areas to the East and South

7.1.2.1 AOC 5A

Remedial excavations have been conducted throughout the site and are discussed in this RIR to the extent that they are needed to demonstrate delineation. **Table 2.3.5-1** includes a tabulation of the excavation area X042 included in the discussion below.

Remedial excavation X042, located near Riverside Drive at the southern boundary of AOC 5A achieved vertical delineation of the PCBs at the southern side of AOC 5A at a depth of 5 feet

below grade. **Appendix 80** contains the laboratory analytical data packages and EDDs for post excavation soil samples at this location.

On March 17 and 18, 2014, Weston implemented a supplemental investigation to delineate BEHP detected in soil samples collected in July and August 2013 from Scrape Area X029 at concentrations above the soil remediation standard for the site. Sampling was performed in accordance with the SAP for this area dated February 11, 2014 (**Appendix 71**). During sampling activities at soil boring locations designated X029-08 and X029-09, Weston encountered residual product at 5 to 9 feet, which is at depths greater than previously observed, in sand layers below the water table. The residual product did not appear similar to other LNAPL previously observed in this area. The presence of this material in sand layers below the water table suggested the possibility of a dense non-aqueous phase liquid (DNAPL), which was not consistent with known contamination conditions at the site.

On September 5 and 8, 2014, Weston and our drilling subcontractor, Advanced Drilling Inc., completed soil borings at locations X029-08 and X029-09, where residual product was previously detected. Sampling was performed in accordance with the revised QAPP dated August 22, 2014 (**Appendix 72**). The soil borings extended through the visibly contaminated zone to a maximum depth of up to 50 feet below ground surface (ft bgs). Our initial replacement boring at location X029-08 did not encounter product; therefore, this boring was abandoned at 25 feet bgs and offset to location X029-08A. Boring X029-09 was halted at 30 feet bgs due to borehole collapse.

Soil samples were collected from the following depth intervals at each location for laboratory analysis:

1. Interval with soil containing visible evidence of product such as heavy staining and positive hydrophobic dye test results;
2. First visibly uncontaminated depth interval below the residual product; and
3. Bottom of the soil boring.

The soil samples were analyzed for Target Compound List (TCL) VOCs, TCL SVOCs, pesticides, herbicides, PCBs, Target Analyte List (TAL) metals, extractable Petroleum Hydrocarbons (EPH) and pH. Laboratory analytical results are summarized on **Table 7.1.2-1.**

BEHP was detected at concentrations above the site remediation standard in the two samples collected from the interval with staining and product, which was encountered between 8 and 9 feet bgs in boring X029-08A and between 5 and 12 feet bgs in boring X029-09. These exceedances were delineated vertically by samples from the first visibly uncontaminated interval which was sampled at 10 feet bgs at X029-08A and 12 feet bgs at X029-09. None of the other target parameters were detected at concentrations above their applicable direct contact remediation standards.

A total of 30 target analytes were detected in the soil samples that were collected from soil borings X029-08A and X029-09. Weston compared the concentrations reported in these two samples with concentrations reported in historical soil samples from the site. The maximum

historical concentration for each of the analytes detected and the associated sample identification are presented on **Table 7.1.2-2**. **Table 7.1.2-2** also presents the range of historical pH results for soil samples. The concentrations of target analytes detected in the samples from soil borings X029-08A and X029-09 fall within the ranges of the historical data. All of the parameters detected in the recent samples were also reported in the historical samples.

Based on these results, Weston concluded that the residual product detected below the water table in the X029 area is not a previously unknown contaminant. The material appears to be primarily BEHP. Because the specific gravity of BEHP is less than 1.0, the presence of this material below the water table is considered to be unusual. However, chemically, the material is similar to contaminants identified in historical samples from the site.

Weston noted that the material extends only a few feet below the water table. These data suggest that the presence of this material below the existing water table is likely attributable to historical releases during periods of lower groundwater levels.

Additional sampling was performed on March 22, 2016 to delineate the stained soil encountered in the vicinity of Scrape Area X029. This work was performed in accordance with the SAP dated March 14, 2016 (**Appendix 18**) and the locations of the soil borings are shown on **Figure 7.1.2-1**. Delineation was achieved by this soil boring program.

7.1.3 AOC 7A: Phthalic Anhydride Residue Area

AOC 7A is referenced by Weston as the Northeast Impoundment (NEI) and additional remediation was conducted in 2012, 2014 and 2015 to 2016. In correspondence dated February 17, 2012, the NJDEP Case Manager specifically requested that Weston develop a site-specific Impact to Groundwater Soil Remediation Standard (IGW SRS) for naphthalene in the soils adjacent at the NEI. Weston completed the evaluation and provided documentation of the naphthalene IGW SRS of 40 mg/kg to NJDEP in June 2013. A copy of the complete submittal is provided as **Appendix 97**.

All crystalline naphthalene was removed from this AOC during the remedial action. Post excavation soil sampling results indicated that some residual naphthalene remains at concentrations above the site-specific IGW SRS in a thin sidewall between the former pond and Sling Tail Creek. This sidewall material was not removed in order to avoid breaching Sling Tail Creek's channel. Based on topography, the residual naphthalene material does not continue across Sling Tail Creek (the elevation of the naphthalene material is higher than the creek's water surface). Inspection of the creek bed and banks confirmed that the naphthalene material is not present. Post-excavation soil sampling will be presented in a separate RAR.

During historical sampling one area of elevated PCBs was detected in soil samples from the western portion of AOC 7A. Previous sampling at soil boring S-14 indicated PCB concentrations greater than 50 mg/kg, which would require management as TSCA waste during remediation. Weston completed sampling to delineate the horizontal and vertical extent of the PCB contamination in this area prior to implementation of the NEI remediation. This work was performed in accordance with the SAP dated February 11, 2014 (**Appendix 71**).

RI is considered complete for AOC 7A. Additional remediation will be required with respect to material remaining in the creek sidewall.

7.1.4 AOC 8: Tarry Area

Scrape area excavations were completed for the areas of this AOC where prior data indicated that NRDC SCC standards were exceeded. For the purposes of delineation, the post-excavation soil sampling data for these scrape areas are provided in **Table 2.3.8-1**. **Figure 2.3.7-1** shows the location of the scrapes and the samples collected to delineate their extent. Results for Scrape Areas X024 through X027 were previously provided in the Onsite RAPR, 11/19/2010 (**Appendix 76**). Results for scrape areas X023A and X023B were not previously reported.

X023A (2012) – The highest remaining PCB concentration in Scrape Area X023A was 1.4 mg/kg in sample X023A-01 (1.5 to 2.0 feet bgs). This concentration is less than the site-specific remediation criterion of 2 mg/kg but is greater than the RDC SCC. This exceedance is delineated to the south and west by locations X023A-06 and X023A-07, respectively. The soil sample from MW-11 provides delineation to the east and samples from AOC 13 provide delineation to the north. This exceedance is delineated vertically by a soil sample from monitoring well MW11S at the 2 to 2.5 foot depth interval was non-detect for PCBs.

X023B (2012) – PCBs remaining are between RDC SCC and NRDC SCC. The southern and eastern sidewall samples from X023B provides delineation to concentrations below RDC SCC. Delineation in other directions had already been confirmed.

X024 (2010) –Post-excavation samples confirmed BEHP concentrations below RDC SCC

X025 (2010) – Post-excavation soil samples confirmed that the highest remaining naphthalene concentration was between RDC and NRDC SCC. BEHP analysis confirmed that BEHP concentration is below RDC SCC. X026 provides delineation for naphthalene to the south.SB227 had already provided delineation to the north and sidewall samples delineate the east and west.

X026 (2010) – Post-excavation soil samples confirmed that BEHP and naphthalene concentrations are below RDC SCC.

X027 (2010) – Post-excavation soil samples confirmed that naphthalene is below RDC SCC.

Based on the results of the excavations and the investigative sampling, small areas where PCBs and naphthalene concentrations are between RDC and NRDC SCC remain at AOC 8. However, the area is delineated on the south and east following excavation. Delineation of PCBs to the north is achieved via contiguous AOC 13. To the west, naphthalene is delineated via AOC 5A. RI is complete for AOC 8 and additional remediation is indicated.

7.1.5 AOC 10B: Former Drum and Waste Storage Area (North of Warehouse 5)

Previously reported data for AOC 10B did not demonstrate horizontal delineation at three points:

- Y4.5 (southeast corner)
- FF3.5 (southwest corner)
- FF3 (western side)

Scrape areas were completed at Y4.5 (Scrape area X013) and FF3/FF3.5 (Scrape area X001 was extended to both former sample locations). The post-excavation soil sampling data for those scrape areas completed the delineation with the exception of PCBs to the southwest. Additional sampling was performed in 2014 to determine the extent of PCBs beyond the excavated Scrape Area. This work was performed in accordance with the plan dated February 11, 2014 (**Appendix 71**). This sampling determined the limits for remediation which was completed in December 2015 in conjunction with the Northeast Impoundment remediation project. Results of that work will be reported separately. Applicable post-excavation soil sampling data are included in **Appendix 81** to complete the delineation of impacted areas in AOC 10B.

X013 extended to between 2 and 3 feet below grade; post-excavation soil sample results (with the prefix "X013") are in **Table 2.3.17-1**.

Post-excavation soil sampling data is included herein to complete the delineation of impacted areas in AOC 10B.

RI is completed at AOC 10B by the data from X013 and X001. EDDs and laboratory analytical data packages for the post-excavation soil samples are in **Appendix 81**.

7.1.6 AOC 13: Southeast Fill Area

Site investigation found isolated hotspots of benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, arsenic and PCBs at AOC 13. RI phase delineation confirmed that these hotspots are isolated, but full delineation was not completed in all cases. Hotspot excavation conducted as part of an approved RAWP completed the delineation. As discussed in Section 2.3.19.2, AOC 13 (**Figure 2.3.7-1)** is delineated to the north by sampling locations within the AOC and to the west by other AOCs. AOC 13 is delineated to the south by soil borings within the AOC. Delineation to the east, and vertical delineation were completed by the following scrape areas, previously reported in the Onsite RAPR, 11/19/2010 (**Appendix 76**):

X017 (2010): Scrape area was 22 feet per side by 3 feet deep. Post-excavation soil sampling results confirmed benzo(a)pyrene, benzo(a)anthracene and naphthalene at or below SCC.

X019 (2010): Scrape area sidewalls were 17 feet or less and the depth was 3.5 feet. Post-excavation sampling results confirmed benzo(a)pyrene, benzo(a)anthracene and indeno(1,2,3-cd)pyrene below SCC.

X022 (2010): Scrape area sidewalls were 15 or 15 feet in length and the depth was 2.5 feet. Post-excavation soil samples confirmed arsenic concentrations below SCC.

Appendix 81 contains the EDDs and laboratory data packages for the excavations discussed above. RI is complete for AOC 13.

7.1.7 AOC 14: Naphthalene Area

The horizontal extent of naphthalene impacts is delineated. Results for scrape areas X012 and X137 were previously presented in the Onsite RAPR, 11/19/2010 submitted to NJDEP (see **Appendix 76**). These results confirm vertical delineation of naphthalene at 7 feet bgs in this AOC.

Appendix 83 is the EDD and laboratory data packages for these scrape areas. Additional remedial action was recently completed in this area and will be reported in a separate RAR.

7.1.8 AOC 18A: Pilot Plant 1

Soil samples with elevated benzo(a) pyrene and PCBs were identified but were not delineated by the previously reported data. Two scrape areas, X131 and X132 were completed in this area. Post-excavation data, previously reported in the Onsite RAPR, 11/19/2010 submitted to NJDEP (see **Appendix 76**) addressed the delineation gaps:

7.1.8.1 Scrape Area X131 – June 17, 2010

This scrape area was designed to remove the benzo(a) pyrene concentration above NRDC SCC at sample location B3. The scrape area encountered a concrete footing on the eastern sidewall at a depth of 1.5 feet (photos and field notes, **Appendix 84**) so no post-excavation sidewall sample was collected from the eastern sidewall. The finished excavation was 8 feet by 8 feet by 3 feet deep (except for the concrete area). Post-excavation soil samples confirmed that benzo(a) pyrene concentration was below RDC SCC. Remediation was complete for X131 and the remedial action also completed the benzo(a)pyrene delineation.

7.1.8.2 Scrape Area X133 – July 1, 2013

X133 was designed to remediate PCB concentration above NRDC SCC at CAP_B-23 and CAP_B-23_5N. The excavation extended to 3 feet depth and five post-excavation soil samples were collected for PCB analysis. Results confirmed PCB concentrations below NRDC SCC but above RDC SCC at two sidewall locations to the west and north. CAP_B-29 and A3 provide delineation to the north.

Because the post-excavation soil samples collected at these scrape areas are needed to complete the delineation at AOC 18A, EDDs and laboratory analytical data packages are included in **Appendix 85**.

Four soil samples remain at AOC 18A with reported PCB concentrations between RDC SCC and NRDC SCC; these are vertically delineated at depths of 9.5 feet bgs or less and horizontally delineated as discussed above and in Section 2. RI is complete for AOC 18A.

7.1.9 AOC 18B: Pilot Plant 2

7.1.9.1 Scrape Areas for AOC 18B

Two scrape area excavations were completed in this AOC, X128 and X130. Post-excavation data, previously reported in the Onsite RAPR (see **Appendix 76**) were used to delineate contamination in this area:

X128 and X128A to remove K3.75 (June 17, 2010)
Scrape area X128 sidewall dimensions were 16, 11, 12 and 14 feet long each. The excavation was 2 feet deep. Five post-excavation soil samples analyzed for BEHP had concentrations below SCC and confirmed that remediation was complete for BEHP at X128.

X130 to remove I3.0 (July 16, 2013)
Scrape Area X130 was completed to a depth of 3 feet below grade. Additional rounds of sampling were completed because initial sidewall samples did not indicate that PCB removal to the NRDC SCC was complete. PCB concentration documented by post-excavation soil samples was between RDC SCC and NRDC SCC. Soil samples K3, B3 (AOC 18A) and SB206 provide delineation for PCBs.

EDDs and laboratory analytical data for the post-excavation soil samples are included in **Appendix 86**.

After the scrape areas were completed, one additional location with PCB concentrations above RDC SCC remained (I3.75).

Delineation for PCBs and BEHP to concentrations below RDC SCC is achieved via three soil samples collected west of AOC 18A in 1988 (delineation in other directions is confirmed by samples within the AOC or samples in adjacent AOC 18A and 9B, **Figure 2.3.10-1)**. These soil sample locations (C3, C4 and C4.5) are included on **Figure 2.3.10-2** and **Table 2.3.26-1** to demonstrate that the RI is complete for PCBs at AOC 18B.

7.1.10 AOC 20: Area East of Sling Tail Creek

AOC 20 was included in the Scrape Area remedial action program and an excavation was completed in 2010 for soil sampling location N23, which exceeded RDC SRS for naphthalene. One scrape area, designated X014 was completed in AOC -20 to address a naphthalene exceedance that was identified in historical sampling data as location N23. Four post-excavation sidewall samples and one bottom sample were collected to confirm completion of the remedial action (X014_01 to X014_05, **Table 2.3.27-1**). Results were non-detect at a maximum RL of 0.4 mg/kg (vs RDC SRS of 6 mg/kg). **Figure 7.1.11-1** shows the location of the scrape area and the post-excavation soil sampling results. Both RI and RA are complete for naphthalene at former sample location N23.

Results for Scrape Area X014 were previously reported in the Onsite RAPR, submitted to NJDEP 11/19/2010 (see **Appendix 76**). These results indicated that the naphthalene exceedance was removed and therefore this portion of AOC 20 was delineated.

During development of this RIR, Weston noted a lead in soil exceedance had been reported in the surface sample collected at location W30 in 1992. This area had not been identified for further action in subsequent remediation documents. In 2016, Weston implemented two rounds of sampling to delineate the lead in soil exceedance.

7.1.10.1 First Delineation Round (March 23, 2016)

As shown on **Figure 7.1.11-2** five soil borings were advanced around original location W30. This work was performed in accordance with the sampling plan dated February 11, 2014 (**Appendix 71**). Samples W30-2 through W30-5 were located approximately 5 feet radially outward for horizontal delineation and sample W30-1 was drilled as close to the original location as possible for vertical delineation.

Soil logs are in **Appendix 87** and laboratory analytical data packages are in **Appendix 88**. Soil logs noted non-soil materials including glass, fabric and non-native gravels. **Table 2.3.27-1** includes the lead analytical data for these samples. Results indicated that delineation to the northwest was completed by W30-3 but no other directions had been delineated, including the vertical. Results in some cases exceeded NRDC SCC as well as RDC SCC.

Because the logs indicated fill and the contaminant distribution pattern was not indicative of a discrete release, historical aerial photographs were examined as discussed in Section 2.3.27, historical discussion of the AOC. Based on the photo interpretation, the interpretation for the source of contamination at this AOC was updated from a spot-release or localized incidence of dumping to a model that fill was pushed westward during the construction of the Route 440 cloverleaf. The 1969 aerial was used to select locations for an additional sampling round (**Figure 2.3.27-2**). To estimate the depth of the fill, a site topographic map was used and the elevations of the top of the creek channel on the east and west sides were compared. Topography between the disturbed area of Sling Tail Creek and the roadway elevation was inspected. A prism of fill approximately 3 to 5 feet in depth was estimated at the location of W30.

7.1.10.2 Second Delineation Round (April 19, 2016)

Results of the March 2016 sampling and aerial photograph review suggested widespread fill spanning the area from Sling Tail Creek to the eastern property line, soil borings were manually advanced at the southern and eastern property lines (W-10 and W-11). This work was performed in accordance with the sampling plan dated April 18, 2016 (**Appendix 89**). Soil samples were collected at what appeared to be the edge of the disturbed area to the north (W30-12) and a sample was collected on the west side of Sling Tail Creek (W30-6), which did not appear to have been impacted by filling concurrent with highway construction. Intermediate samples W30-7 to W30-9 were also collected in the event that the fill material did not cover the disturbed area observed in the aerials.

Figure 7.1.11-3 shows the second round sampling locations and **Table 2.3.27-1** provides the data. Soil logs and laboratory packages are in **Appendices 87** and **88**. Soil boring W30-13 encountered a gray clay at a depth of 4 feet bgs. This clay was similar in appearance to the native clay found across the site and Weston concluded that this depth represents the bottom of the fill. A sample from 4 to 4.5 feet bgs achieved vertical delineation of lead above SCC.

Based on the historical aerial photographs and physical observations of the fill material, the fill appears to be unrelated to historical or current industrial operations at the site. The fill appears to have been placed during construction of nearby roadways. The fill material meets the definition of historic fill and has been delineated to the eastern and southern property lines. Offsite delineation is not required. **Figure 7.1.11-3** shows the extent of the fill originating offsite to the east and covering most of the area of AOC 20.

7.1.11 AOC 21B Sling Tail Creek

The analysis presented in Section **Error! Reference source not found.**2.3.29 for AOC 21B concluded that vertical delineation was needed at former sampling location ST-3 (shown on **Figure 7.1.11-2**). On March 23, 2016, Weston collected two sediment samples from the mapped former location of ST-3. This work was performed in accordance with the sampling plan dated March 14, 2016 (**Appendix 18**). These samples were designated ST-3-1 B-C-0 and ST-3-1-C-D-0 and they were collected from 0.5 to 1.0-foot and 1.0 to 1.5-foot depth intervals, respectively. The sediment samples were analyzed for PCBs and results were non-detect, thus completing the vertical delineation at this location.

RI is considered complete at AOC 21B. **Appendix 90** contains the laboratory analytical data package for these samples and **Table 2.3.29-1** summarizes the data.

7.1.12 AOC 23: Channels B and C

On March 25, 2014 surface water sample CPW-01 was collected in the downstream end of Channel B near the confluence with Channel A. Analysis included SVOCs and PCBs; the only detected analyte was BEHP at an estimated concentration of 1.4 ug/L, which is marginally above the Human Health Criterion of 1.2 ug/l (**Table 2.3.32-7**).

On October 23, 2014 three surface water samples designated CCD-SW-102314-01 to 03 were collected and analyzed for SVOCs and PCBs. Sample CCD-SW-102314-01 was collected from Channel C as runoff entered the Riverside Drive drainage culvert (**Figure 7.1.15-1**). All analytes were non-detect except for BEHP, which was detected at an estimated concentration of 1.3 ug/L. This concentration exceeded the USEPA Region 5 screening level for BEHP in surface water of 0.3 ug/l and the human health criterion of 1.2 ug/l. There was no trend in the BEHP results (either increasing or decreasing with distance from Hatco) exhibited in the three samples, but the sample from Channel C had the lowest reported concentrations. PCBs were non-detect in all three samples.

Channel C flows into and out of Woodbridge Pond, so the delineation of BEHP in surface water downstream of Channel C is addressed with AOC 24 and AOC 25 (Sections 2.3.32**Error! Reference source not found.** and 2.3.34 and 7.1.15).

With regard to sediments at AOC 23, RI phase sampling and post-excavation sampling from the associated scrape areas completed the delineation of PCB and BEHP in sediment. No further remedial investigation for sediment is required based on current sediment data.

As noted in Section 2.3.31, some isolated areas of soil impacted with PCBs at concentrations above 0.49 mg/kg remain in AOC 23. RI is complete for AOC 23; groundwater is addressed as AOC 15.

7.1.13 AOC 24: Woodbridge Pond

7.1.13.1 Sediment Sampling

In March 2014, Weston collected sediment samples to complete delineation of the PCB and BEHP detected in Woodbridge Pond sediment at concentrations above the site-specific criterion of 1 mg/kg PCBs and proposed remediation goal of 22 mg/kg BEHP. This work was performed in accordance with the supplemental SAP for this area dated February 11, 2014 (**Appendix 91**). Samples were collected for horizontal and vertical delineation. The sample locations were designated CP-71 through CP-89. **Table 7.1.14-2** summarizes data for samples CP-71 to CP-80 collected at AOC 24. **Figure 2.3.32-1** shows the locations of each sampling point for the sediment sampling and the Scrape Area excavation X104 (see Section 6.0) that was completed to remediate the exceedance previously reported at sediment sample CP-3. Field sampling was performed in accordance with the *New Jersey Technical Requirements for Site Remediation* (TRSR, N.J.A.C. 7:26E), the NJDEP *Field Sampling Procedures Manual* (August 2005) and the project QAPP. The following process was used at each sample location, accessed via boat:

- Depth to top of sediment was determined using a weighted disc attached to a measuring line. The weighted disc was gently lowered to the top of sediment; the distance from the top of sediment to the water surface was measured.
- Samples were collected using a slide hammer device consisting of a 6-inch steel barrel lined with a flexible polyethylene core liner. Once the barrel was set into the top of sediment, field personnel used the slide hammer to advance the core to the target sample depth.
- A high lift jack was used to slowly pull the core barrel out of the sediment until loose enough to drag onto the boat deck.
- Once on deck, the core catcher was removed and the liner was extracted. Total sediment recovery was recorded. The liner was cut longitudinally and samples were collected directly from inside the liner. The samples were screened in the field for organic vapors using a photoionization detector (PID). Disposable scoops and dedicated stainless steel bowls were used for sample collection.
- Sediment samples were collected at discrete six-inch intervals from designated depths at each location. Samples were collected, homogenized as necessary, and placed directly into laboratory-prepared sample containers.

- Total sediment thickness was determined by calibrating the barrel on the outside to determine the bottom of sediment that was penetrated during sampling.

The sampling included a bathymetric survey. Pond bathymetry is shown on Figure 2.5.33-1. Sample locations for the last round of sampling conducted to complete the pond delineation are shown on **Figure 7.1.14-1.**

Table 7.1.14-1 summarizes the sampling locations and depths, analytical parameters, and sampling methods for the samples that were collected in 2014 to complete delineation of the results discussed earlier in Section 2.3.32.

For samples collected in areas with suspected PCB concentrations above 50 mg/kg, a TSCA-compliant decontamination procedure was performed (locations CP-72, CP-73, CP-74, CP-75, CP-76, CP-77, CP-78, and CP-79). Wipe samples were collected and analyzed to confirm adequate PCB decontamination before the equipment was removed from the site.

7.1.13.2 Pond Bottom Stratigraphy

Weston collected sediment cores at 93 locations within Woodbridge Pond. The sediment cores locations were designated CP-1 through CP-89, CP-3_5N, CP-3_5S, CP-3_5E, and CP-3_5W. Lithology was not recorded at 11 locations. Following is a summary of the stratigraphy recorded at the remaining 82 locations. Copies of the sediment core logs are presented in **Appendix 56**. **Figure 7.1.14-2** is a generalized cross section through the pond illustrating the strata observed in sediment cores. **Table 7.1.14-3** presents a summary of the stratigraphy encountered.

Sediment cores penetrated 1.5 to 4.5 below the pond bottom. Typically the sediment cores encountered three layers. The first layer was an organic silt. The second layer consisted of clay and/or a mixture of sand with silt and/or clay. The third layer was a medium to coarse sand.

The first interval encountered at 74 of the 82 locations logged was organic silt. Where the organic silt layer was encountered, it ranged in thickness from 0.5 to more than 4.5 feet. The organic silt layer was absent at 8 of the 82 locations (CP-1 through 6 and CP-3_5S and CP-3_5E). These eight locations are located at the edge of the pond; the only material encountered at these locations was 1.5 feet of fill material and/or sand.

At 23 locations the organic silt was underlain by 0.5 to 3 feet of low permeability inorganic clay and/or silt. At 17 locations the organic silt was underlain by a mixture of sand with silt and/or clay. Where it was present, the second layer ranged from 0.5 to greater than 3 feet thick. The second layer was absent below the organic silt layer at 19 locations. The sediment cores did not fully penetrate the organic silt at the remaining 16 locations.

The third layer, consisting of sand, was encountered in 38 of the 74 locations. The sand layer was not fully penetrated at any of the core locations. The top of the sand layer ranged from 0.5 to 4 feet below the pond bottom. The elevation of the top of the sand layer ranged from 5.5 feet msl at CP-55 to 14.5 feet msl at CP-13. This sand layer appears to be the top of the regional water-bearing zone that underlies the Hatco site and surrounding areas. It is noted that Woodbridge

Pond is a manmade feature that likely resulted from clay mining activities and thus the pond stratigraphy does not reflect typical natural pond sediments.

7.1.13.3 PAHs and Metals in Pond Sediment

Eight sediment samples from the western pond outlet and three sediment samples from the pond itself (CP-74, CP-77 and CP-80) were analyzed for parameters in addition to PCBs and BEHP. The outlet sample locations were designated CP_OUTLET_01 through CP_OUTLET_4. Samples from these locations were analyzed for SVOCs. The sediment samples from locations CP-74, CP-77 and CP-80 were analyzed for VOCs, SVOCs, pesticides, herbicides, EPH and metals. Results for these analyses were compared to ESCs (**Table 2.3.31-2**). No VOCs, pesticides or herbicides were reported at concentrations above an ESC. The following SVOCs were detected in outlet samples: acenaphthylene, anthracene, benzo(a) anthracene, benzo(a) pyrene, benzo(b) fluoranthene, benzo(g,h,i) perylene, benzo(k) fluoranthene, carbazole, chrysene and dibenz(a,h) anthracene. Concentrations were highest in the sample farthest from the pond but closest to Riverside Drive (CP_Outlet_04). The specific SVOCs detected and the location of the highest concentrations are consistent with impact from highway runoff. NJDEP's Diffuse Anthropogenic Pollution (DAP) Guidance (Version 1.1, April 30, 2013) specifically notes PAHs as typical "DAP" source contaminants. Based on this conclusion, Hatco 's only regulatory obligation with regard to these PAH compounds is to present the data to the property owner.

Metals reported in PMK's SI sediment samples for other parcels included arsenic, lead and copper. Metals other than arsenic, lead and copper that exceeded ESCs in Woodbridge pond sediment were cadmium, total chromium, mercury and nickel. Concentrations of these four metals in pond sediment samples were compared to concentrations from sediment samples in Channels B and C to evaluate if Hatco operations may be a source of these metals. Section 2.5.32 presents analytical results for Channels B and C (AOC 23). Analytical data for AOC 23 did not indicate a source for metals on the Hatco site. Cadmium concentrations are higher in Woodbridge Pond than anywhere on the Hatco site and no source material containing elevated concentrations of mercury, nickel and chromium was found on the Hatco site. There is no record of releases of these metals from the Hatco site. For these reasons it is concluded that these metals are not associated with the Hatco site, and therefore, and no further delineation of sediments containing marginal exceedance of ESCs for cadmium, chromium, mercury and nickel is required as part of the RI of the Hatco site.

7.1.13.4 PCB and BEHP in Sediment Delineation

Section 5.3 of this RIR discusses the regulatory standards applied to various media. As indicated on **Table 4.3.-1**, a proposed BEHP remediation goal of 22 mg/kg has been applied to offsite sediment data (Technical consultation memo with NJDEP, **Appendix 92)**. The PCB remediation goal applied to sediment data is 1 mg/kg (USEPA approval letter, **Appendix 1)**.

The horizontal and vertical extent of pond sediment with PCBs above 1 mg/kg and BEHP above 22 mg/kg is shown on **Figure 2.3.32**-1. The vertical delineation is generally up to two feet below the sediment interface, with isolated instances of concentrations above the remediation goals up to three feet below the sediment interface. **Table 7.1.14-2** identifies the depth at which PCB and

BEHP was delineated at each of the sample locations. The highest concentrations were reported closest to the Channel C inlet, as would be expected for a surface water source from Channel C. In the northeastern edge of the pond, the maximum extent of the pond observed in historical aerial photography was used as the boundary for the sediment delineation **(Figure 2.3.32-1**). The maximum extent of the water surface was selected because the PCBs and BEHP are associated with water-transported sediment; no direct discharge to soils from Hatco is documented or suspected around Woodbridge Pond. Additionally, the dumping and deposition of 55-gallon drums recorded during the preliminary assessment (PMK PA, 1996 discussed in Section 2.3.32) would have been a direct mechanism for soil impact on this property; the dumping is not tied to Hatco's operations. An SI done by PMK included soil boring SB-10 in the southeastern shore of the pond where pond overflow would be most likely. The soil sample from this location did not indicate PCB or BEHP concentrations in excess of SCC.

As previously discussed above, outlet samples from the swale at the southwest portion of Woodbridge Pond confirmed that PCB and BEHP impact does not extend into or beyond the pond at this swale.

Appendix 93 includes HAZSITE files and laboratory analytical data packages for the 2014 sampling round since this information has not previously been submitted to NJDEP.

7.1.13.5 Surface Water Sampling

One surface water sample was obtained on January 15, 2014, to develop data for remediation permit applications. The surface water sample was collected by placing a dedicated, disposable laboratory-cleaned, glass sampling container into the surface water in the pond. The surface water was transferred from the disposable container to laboratory-prepared sample containers. Surface water sample WTP_SW_011514 was analyzed for the following parameters:

- VOCs
- SVOCs
- Organochlorine and Organophosphorous Pesticides
- Pesticides
- Herbicides
- Radionuclides
- pH
- Total phenols
- Chloride

No VOCs were detected and MDLs were less than the GWQS (2005). No SVOCs were detected but some MDLs exceeded GWQC. The SVOCs for which MDLs were elevated above the GWQC are not Hatco COCs; therefore these elevated COCs are not a concern for this RIR. No pesticides or PCBs were detected and MDLs were below GWQC. Except for iron, no metals were detected. MDLs for antimony, arsenic and thallium were above GWQC. Iron concentration exceeded the GWQC of 300 ug/l (note: iron is not a Hatco COC). Organochlorine pesticides, organophosphorous pesticides, cyanide and phenols were not detected.

Surface water samples were collected from two locations on March 26, 2014 (Note: the laboratory report incorrectly identifies the sample date as March 25, 2014). The samples were collected to evaluate current surface water discharge from the pond. The sample locations were designated CPW-01 and CPW-02. Sample CPW-01 was collected at the confluence of Channel A and Channel B. Sample CPW-02 was collected at the location that Channel C exits from the southeast portion of Woodbridge Pond. **Table 2.3.32-1** provides results for the surface water samples. Samples CPW-01-0, CPW-02-0 and CPW-02-1 (duplicate) were analyzed for SVOCs and PCBs. BEHP was reported at an estimated concentration of 1.2 to 1.4 ug/l (Human Health SWQS is 1.2 ug/L for BEHP).

Based on the investigative work completed to date for AOC 24, contamination associated with the Hatco site has been delineated and the RI is complete.

7.1.13.6 Water Sample Data Quality Review

Data quality was evaluated by comparing the analytical results for field duplicate sample pairs (**Table 7.1.14-5**). Relative Percent Difference (RPD) was calculated for each sample pair and analyte where results indicated a detection. The only compound detected in an original sample and a duplicate pair was BEHP in sample CPW-02; RPD for BEHP was 2%. The RPD results indicate precision in the sample

7.1.14 AOC 25: Channel D

In February 2014 Weston prepared a Channel D Field Sampling Plan (**Appendix 71**) designed to complete the delineation of BEHP and PCB impacts in AOC 25 (referenced in documentation as Channel D). This work was performed in accordance with the supplemental SAP for this area dated February 11, 2014 (**Appendix 94).**

QA/QC procedures for the sampling round were in accordance with the QAPP submitted as part of the 2009 Addendum 3 to the Consolidated RAWP. Sampling locations began downstream and proceeded upstream to minimize the possibility of disturbing and redistributing sediment prior to sampling an area. For samples in areas where PCB content greater 50 mg/kg was expected (CDG-363 through CDG-365), a TSCA-compliant decontamination procedure was used.

Sampling procedures are presented in the Field Sampling Plan (**Appendix 71**). Surface water samples were collected to evaluate water quality and assess whether a sheen previously reported in Channel D may be related to the Hatco site. As with the sediment sampling, surface water sampling began downstream and proceeded upstream. Samples collected in this program were analyzed for BEHP and, in surface sediment and surface water samples, PCBs also. No sheen was observed during the sampling effort.

Laboratory analytical data packages and HAZSITE files for the 2014 sampling event are in **Appendix 94.**

7.1.14.1 Surface Water

On February 20, 2014, CDG_SW-01 and CDG_SW-02 were collected from ponds in the center of the GreDel lowland area where the highest BEHP and PCB concentrations were detected in sediment. The surface water samples were analyzed for BEHP and PCBs. These samples were collected from transect locations CDG_363 and CDG_365 respectively (**Figure 7.1.15-2, Table 2.3.33-1**). Results exceeded the BEHP SWQS of 0.3 ug/l (lowest of Human Health and Aquatic Fresh Water criteria).

On October 23, 2014 three surface water samples were collected by Weston and analyzed for SVOCs and PCBs. The samples were collected at the locations shown on **Figure 7.1.15-1**. All analytes were non-detect except for BEHP, which exceeded the SWQS for BEHP of 0.3 ug/l and the human health criterion of 1.2 ug/l. The following lines of evidence were considered in evaluating whether to collect additional surface water:

- Potential surface water discharge from Hatco was already evaluated and delineation was completed in 1999;
- Hatco is no longer discharging to surface water;
- Substantial remediation projects have occurred on Hatco that reduced the concentration of BEHP in Channels A, B and C since 1999;
- In 2014 two sampling events occurred:
- February 2014: Weston's Sampling Plan called for collection of two "worst case" samples in the ponded areas on the EPEC property; these samples were intended to assess the presence/absence of a sheen on the ponds. No sheen was observed, but the samples were collected in areas where BEHP concentrations in sediment were high ("hot spots")
- The sampling technique involved wading into the ponded areas to collect samples; disturbance of bottom sediment may have occurred even though the surface water samples were collected before the sediment samples
- October 2014: Weston split samples with USEPA in the culvert area. The samples did not confirm that BEHP was being discharged to the culvert from Hatco
- 2014 sampling data is being presented for completeness; and an obligation to report all data (whether it supports the conclusions or not);
- The BEHP identified in EPEC parcel ponds is in AOC 25c (not AOC 25a, which was already delineated);
- BEHP concentrations in AOC 25a are relatively low and not likely to be contributing to a surface water issue; and
- Sediment delineation was achieved and BEHP in ponded areas would be expected to originate in the sediment.

7.1.14.2 Sediment

Between February 17 and 20, 2014, Weston collected sediment samples from 21 locations on the GreDel and Woodbridge Township properties (Tax Block 77, lots 100 and 100.01. (**Figure 7.1.15-2**) Analytical results are summarized on **Table 7.1.15.1**). QA/QC information is provided on **Table 7.1.15.3**. Soil logs are in **Appendix 95.**

Samples were collected from the following locations:

- Across one north-south running transect biased towards historical drainage channels and standing water;
- Across two east-west running transects, to evaluate for potential Hatco impacts in historical drainage areas, and;
- Four (4) samples located in the current stream channel just north of the discharge to the Raritan River.

Previous data from the southern edge of the EPEC property (Bock 62, Lot 2) indicated PCBs in shallow sediments (0.0- to 0.5-foot depth interval) at concentrations greater than 1 mg/kg and BEHP in shallow and deeper sediments (up to 3 feet below grade) at concentrations greater than 0.75 mg/kg. Therefore, surface sediment samples from each of the 21 locations were analyzed for PCBs and BEHP. Deeper samples were collected at the 2.0- to 2.5-foot or 2.5- to 3.0-foot depth interval at each location and analyzed for BEHP.

Three sediment samples had PCB concentrations in excess of 1 mg/kg. These samples were located on the northern portion of the GreDel parcel. The PCB in sediment exceedances were delineated by samples to the south on the GreDel and Woodbridge Parcels.

BEHP data for these samples are shown on **Figure 7.1.15-3.** BEHP concentrations exceeded the NJDEP screening level of 0.75 mg/kg in most of the samples. BEHP in sediment exceedances greater than the proposed remediation goal of 22 mg/kg have been delineated at the downstream limit of Block 77, Lot 100.

7.1.14.3 Delineation Summary

BEHP and PCBs in sediment have been delineated past the point where Hatco discharges would have encountered other industrial-related discharges and associated sources of contamination. The northern portion of AOC 25b exhibited the highest concentrations observed in Channel D for BEHP and PCBs. Exceedances of similar magnitude are present down a channel constructed adjacent to EPEC. PCB exceedances of the site-specific sediment remediation goal of 1 mg/kg have been delineated within Block 77 Lot 100.01. BEHP concentrations above the proposed remediation goal of 22 mg/kg are delineated near the southern limit of Block 77 Lot 100, which is a common property line with Tilcon. Surficial sediment is delineated to 0.75 mg/kg (ESC); deeper sediment samples are within an order of magnitude of the ESC.

Vertical delineation data for sediment samples indicate impact up to 8 feet below the sediment surface for BEHP in AOC 25.

PCB impact is delineated to 3 feet depth except for isolated hotspots where impact reaches 5 feet depth.

Soil impacts are delineated to the west at the former clay railroad berm. The eastern boundary of soil impact is delineated for PCBs to 0.49 mg/kg by soil samples with the exception of the area disturbed by filling from the GreDel parcel. Sampling was limited by the property owner to soils determined to be below the fill. However, the following lines of evidence indicate that the BEHP potentially attributable to Hatco discharges did not migrate further eastward:

- The mechanism for transport of Hatco impacts was surface water flow through Crows Mill Creek and Channel D. Before filling activities on the GreDel property, channel flow would have been unimpeded. Based on historical aerial photographs, the filling began between 1963 and 1972, progressing from the east, thereby redirecting the surface migration pathway to the west. Surface water flow in the area to the west of the fill appears to have slowed and surface water ponding became evident, increasing the areas for sediment deposition.
- The filling activities to the east would have pushed contaminants westward. This is consistent with the distribution of the PCB and BEHP "hotspots" that occur in the western side of the lowlands.
- The imported fill itself is of unknown quality; the 1979 aerial shows material of many different hues being placed in the eastern portion of the lowlands.
- A decreasing trend in BEHP concentrations from west to east has been established by existing sampling.
- Kriging was used to contour the existing data; the kriging used a log-normal data distribution as a basis to project the "clean zone" to the east. As indicated in Figure G, that clean zone lies within Block 62 Lot 2 and does not continue onto the GreDel parcel to the east. The Kriging provides a conservative estimate; the physical processes described above would have further restricted eastward migration.
- The GreDel parcel has been remediated using a cap and Deed Notice; these remedies are also protective of the relatively lower concentrations of BEHP shown in the easternmost samples, which were collected beneath up to 13 feet of fill material.

Therefore, based upon the above summarization and the extensive data set for the site, horizontal and vertical delineation of Hatco PCB and BEHP contributions and potentially comingled discharges are complete for AOC 25a, b and c in accordance with applicable NJDEP regulation and guidance.

HAZSITE submittals are provided in **Appendix 94**.

SECTION 8.0
SITEWIDE TECHNICAL OVERVIEW AND CONCLUSIONS

8.1 SITE STATUS AND CURRENT CONDITIONS

The RI is deemed complete based on the following:

- There is no ongoing discharge (LNAPL is delineated and contained) and LNAPL recovery is ongoing (Section 5.2)
- The groundwater plume is delineated and is stable (Section 2.3.21 and 8.2)
- RAs are being implemented (Section 7)
- Soil, Groundwater, Sediment and Surface Water delineation complete for the site; thus completing the RI phase of work (Sections 2 and 7)

8.2 PROPOSED CLASSIFICATION EXCEPTION AREA

The primary ground water contaminants identified at the subject site are SVOCs, VOCs, PCBs and some heavy metals. The groundwater contamination has been horizontally and vertically delineated.

Based on historical ground water information collected from previous site and remedial investigations, the historical onsite operations that have been identified to be the potential sources of the groundwater contamination detected at the Site, include:

- The Production Area
- The Muck Area
- The Northeast Impoundment, and
- LNAPL

The extent of constituents in ground water reported at concentrations above the GWQS have been delineated and are limited to onsite or in close proximity to the western site boundary. Remediation activities, including soil extraction and LNAPL recoveries, have been ongoing. Based on the historical groundwater data, the horizontal and vertical extent of groundwater contamination associated with the Hatco site is stable and/or shrinking, and, based on this assessment, is not expected to exceed its current extent. A Classification Exception Area is proposed for the Site contaminated groundwater. The duration of the CEA cannot be determined at this time since source remediation is still ongoing at the Site. The extent of current known groundwater contamination is proposed to be used to define the CEA extent (**Figure 8.2-1**). A revised CEA with calculated/projected the distance of plume migration and CEA duration will be submitted once the remediation is complete.

SECTION 9.0
UPDATED RECEPTOR EVALUATION

The initial receptor evaluation (RE) was prepared in accordance with the Technical Requirements for Site Remediation (N.J.A.C. 7:26E-1.12 through 1.16) and submitted to NJDEP on March 1, 2011. The receptor evaluation was conducted relative to land use, ground water, vapor intrusion (VI) and ecological receptors. The initial receptor evaluation included data which were collected during RI activities at the site.

As required by 7:26E-4.9(a)2, an updated receptor evaluation and RE Form have been prepared based on the information obtained during RI activities and are included with this RIR in **Appendix 96**.